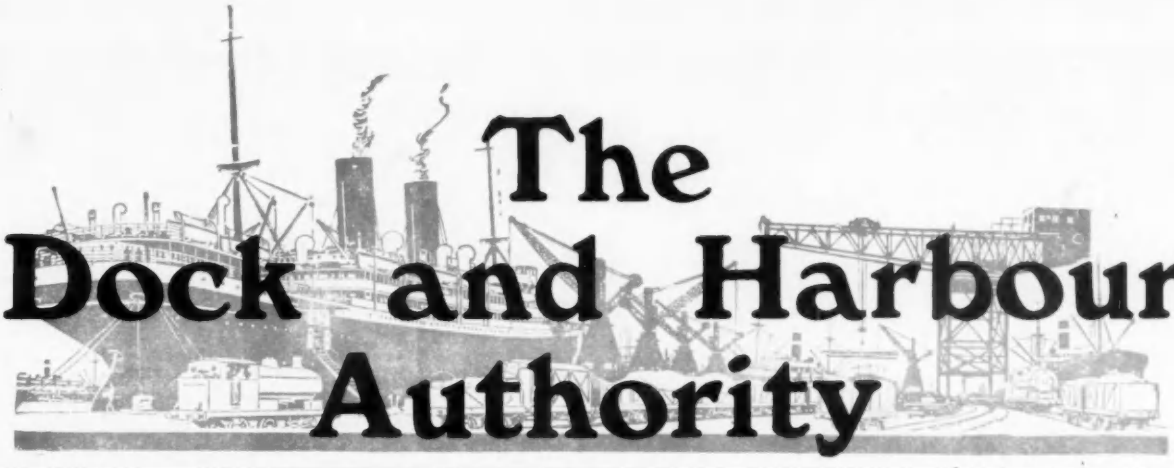

The Dock and Harbour Authority

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CONTENTS

EDITORIAL	231
NEWPORT DOCKS	233
CORRESPONDENCE	236
COAST DEFENCE AGAINST MARINE ACTION	237
PROPOSED DOCKISATION OF RIVER HULL	240
MORE FREE PORT AREAS DEMANDED	240
NOTES OF THE MONTH	241
THE NEW BREAKWATERS AT THE PORT OF LEITH	242
THE BOMBAY PORT CATASTROPHE	245
THE DOCK AND HARBOUR AUTHORITIES' ASSOCIATION	246
THE PORT OF LONDON AS BASE FOR THE INVASION OF EUROPE	250
AMERICAN ARMY OPERATION OF EUROPEAN PORTS	250
SOUTHAMPTON HARBOUR BOARD	251
NOTABLE DOUBLE-ACTION GRAIN ELEVATOR-CONVEYOR	252
THE SINGAPORE FLOATING DOCK	252

Editorial Comments

Newport and the South Wales Ports.

Newport is rather a frequent designation for a port district. There are over fifty Newports in various parts of the world, five of them in England, the best known being the Newport in Monmouthshire, the subject of this month's leading article; the others are in the Isle of Wight, in Essex, in Yorkshire and in Shropshire.

The Newport in Monmouthshire, anciently known as Novus Burgus, has taken the place of the old Roman City of Caerleon about 3 miles distant. Its historical records, however, are not many, and it does not appear to receive mention before the beginning of the Xth Century. Its modern importance dates from the development of the coal-mining industry in South Wales and the export of coal to foreign countries.

The early history of Newport is associated with the Norman Castle, which was built on the west bank of the River Usk in the XIIth Century, for the purpose of repelling the attacks of the Welsh, who frequently captured Caerleon from the Normans. During the reign of Edward I, the castle played an important part in the War of the Barons, due to the quarrel between the Earl of Gloucester and the Earl of Leicester. In later years, the castle was seized and captured by Cromwell's troops during the Civil War.

It is interesting to note that Newport possessed a foreign trade as far back as the XVIth Century. This trade has steadily developed ever since, subject, of course, to the inevitable but temporary setbacks due to periods of continental hostilities. There is every expectation that when the present conflict is over, Newport and its companion ports in South Wales will experience a welcome expansion of trade, for which their port facilities and equipment are admirably suited.

The Port of Bombay Catastrophe.

The second report of the Commission on the Bombay Port Catastrophe in April last year does not add any material information to that already contained in the earlier report, its wider purview being concerned almost entirely with the measures taken, or regrettably omitted, to prevent the spread of the fires originated by the explosions. One outstanding fact is emphasised and deplored, viz. : the absence of a supreme authority to issue operational orders, as a result of which fire-fighting efforts were scattered and unco-ordinated.

It is little use crying over spilt milk, but the tragic event should cause all port authorities to take careful stock of their fire-fighting resources and arrangements, and above all to consider the possibility of having to deal with a sudden and unexpected outbreak of great magnitude. *Sors hodierna mihi, cras illa tibi sit* is a warning prominently exhibited on the walls of the unfortunate Port of Bombay.

Coastal Defence Works.

In view of the interest displayed by foreign governments in the protection of their coast lines from the insidious ravages of the sea, as evinced in an article, the first instalment of which, in translated form, is reproduced in this issue from a Spanish Journal, it is a matter for surprise and regret that no action (apart from minor sporadic and largely ineffectual steps by local frontagers) has been undertaken in Great Britain to conserve the extensive stretches of beach and shore land which are continuously threatened by marine action, and this despite the repeated protests of those who have suffered therefrom. Numerous attempts have been made from time to time to induce the British Government to move in the matter. Eventually in July, 1906, a Royal Commission was appointed to enquire into the circumstances and in May, 1911, they issued their third and final report recommending the establishment of a central Sea Defence Authority. But, as in the case of many other admirable recommendations of Royal Commissions, this was duly pigeonholed and quietly ignored. At any rate, nothing so far has been done to implement it.

It is by way of reviving a subject of such serious concern that we are publishing the article alluded to above, descriptive of engineering methods adopted on the Continent for dealing with and preventing encroachment of the sea on susceptible coastal areas. These methods, and others of local efficacy, have already been practised by English engineers, but a vast amount of protective work remains to be done if a stop is to be put to the further loss of valuable land. The trouble is finance; local landholders can hardly be expected to face considerable expenditures which ought really to be defrayed by the Exchequer.

It is true that to some extent there is the counter-balancing phenomenon of accretion, resulting in certain districts in an actual projection of the shore line into the sea, but the trifling area so gained, being mostly composed of sand and shingle, is of little value compared with the agricultural land which has been, and continues to be, sacrificed by indifference and neglect. On the East Coast of England especially, large falls of soft, friable cliff,

Editorial Comments—continued

occasionally resulting in the engulfing of even dwellings and hamlets, are recorded in the press from time to time. To mention only one instance, the Borough Surveyor of Lowestoft recently informed us of "very heavy erosion" in the neighbourhood of Pakefield, "approximately 50 yards of cliff being eroded in three years."

It is high time the matter be taken up by Parliament and the Central Coast Defence Authority constituted.

Municipal Relations with Harbour Boards.

Although definite municipal control of ports is not greatly in evidence in Great Britain (there are two notable instances: Bristol and Preston) yet in several cases there is close association through the agency of representatives of civic interests on port authorities. Not the least important of these is the dyarchy at Southampton where railway ownership of the docks is combined with quasi-civic management of the harbour. Two addresses on the subject recently given by the Docks and Marine manager of the Southern Railway and an Alderman of the Borough Council are reproduced in this issue and are illustrative of a singular course of evolution in port administration.

The Corporation of Southampton, a port commission, a dock company and the Southern Railway, have all taken a turn at control of the port or in exercising preponderating influence in the direction of its affairs. At the present time the Harbour Board is a composite body of miscellaneous interests, independent of the dock system, which remains in the hands of the railway company.

A somewhat interesting issue is raised by the fact that the town is entitled to, and receives a one-fifth share of the Harbour Board's income from shipping dues. At first sight, it appears to some extent anomalous that the municipality should be subsidised from harbour funds towards purely civic objects, and Alderman Lewis' contention that the harbour is the possession of the town and therefore the latter should benefit from the dues levied on shipping is undoubtedly controversial. So long, however, as the Southern Railway Company continue to shoulder the whole expenditure on the docks of the port, the controversy is hardly likely to come to a head, but it is conceivable that a situation might arise in which harbour funds were not available in sufficient amount to meet the needs of the port. This contingency apparently is to be met by Alderman Lewis' assurance that in such a case the town would not hesitate to come to the support of the Harbour Board. Perhaps this will prove to be the case, since the town is largely dependent on the port for its prosperity and prestige. None the less, the decision would rest with the Borough Council and there will be those who feel that the needs of the port should not be dependent on the generosity of the town in dispensing funds forthcoming from shipping contributions.

Tay Estuary Model.

The decision, recorded elsewhere in this issue, come to by the Dundee Harbour Trust to have a scalar model made of the Firth of Tay in the vicinity of the Port of Dundee in order to investigate experimentally the likely effect of certain proposed reconstruction and development works in the estuary, before departing from the present shore line and interfering with the existing regimen, is both wise and prudent.

The use of scalar experimental models is rapidly gaining favour in harbour and river engineering circles, having already proved of value in several notable instances, such as the Rangoon and Severn Rivers. Its application to the Port of Leith and the entrance of the Firth of Forth has been the subject of a technical description appearing in the last and present issues of this Journal. There can be little doubt that the determination, by means of scalar-models, of changes in channel beds and currents arising from river regulation works is both feasible and reasonably accurate, despite the handicaps imposed by the restricted size and reduced scales of the models.

Time and expense are, of course, factors of considerable importance in coming to a decision on the adoption of model investigation since models are costly and the period of tests necessarily lengthy, but when it is borne in mind that river works and their unskilful application may mar the entire future of a port, it is obvious that no niggardly economy should be allowed to stand in the way of a thorough and complete preliminary investigation. There are ports in the world at one time possessing a flourishing trade, but now derelict or languishing in obscurity, because ill-devised measures were undertaken for the supposed improvement of their approach channels.

The trustees of the Port of Dundee have wisely decided that no reproach for hasty and ill-considered action shall be laid at their door.

The Dock and Harbour Authorities' Association.

As the matter is still *sub judice* by the Ministry of War Transport, no official information has been vouchsafed to the press about the attitude of the Dock and Harbour Authorities' Association in regard to post-war organisation of the docks and harbours of the United Kingdom. It has simply been announced that the report of the committee appointed to consider the matter was unanimously accepted by the Association at the Annual Meeting, without any indication of its purport or of the committee's recommendations. However disappointing the withholding of information on a topic of such vital concern may be to many of our readers, the censorship of the Association precludes any further discussion of the subject in these columns until such times as the secret is officially divulged.

Master Porterage at Liverpool.

Some dissatisfaction has recently been expressed, we learn, by the Liverpool Chamber of Commerce in regard to certain alleged defects in the system of quayside porterage at the Port of Liverpool and, in particular, the functions exercised by Master Porters, one of the three bodies of workers licensed, though not employed by the Mersey Docks and Harbour Board to handle cargoes, the other two being Master Stevedores and Master Lumpers, who deal respectively with the loading and discharging of goods.

The Chamber of Commerce, we understand, has forwarded to the Dock Board a memorandum expressing their view that a special official of the Board acting under the authority of the Chief Traffic Manager, should be assigned the duty of dealing promptly with complaints from consignees respecting the discharge of the Master Porters' duties, one of which, the subject of complaint, is the notification without delay of unclaimed goods. Should any special problems or difficulties arise, the Chamber urges that these should be referred to a standing tribunal, composed, it is suggested, of representatives of the Dock Board, of the Master Porters' and Master Stevedores' Association and of the Chamber of Commerce Commercial Policy Committee.

There are possibilities of defect in all operating organisations and after weighing the evidence adduced, the Board are sure to give full consideration to the representations of the committee and do everything in their power to remove grounds for complaint against a service which has performed such good work in the past in maintaining the high standard of efficiency at the port.

Leith Dock Development.

Following the works recently completed for the enlargement and protection of the harbour, the Leith Dock Commissioners are embarking on an energetic policy of dock improvement.

The post-war development of the docks has been under consideration by the Commissioners for a considerable time, and a programme of new works has now been prepared.

The first item under the scheme will be the construction of jetties and permanent navigation lights at the ends of the new east and west breakwaters, and provision of oil bunkering facilities at the landward end of the new east breakwater.

Other improvements include the substitution of electric crane equipment at various quays and jetties throughout the docks to take the place of hydraulic equipment, a number of new sheds, alterations to the railway and roadways at the Edinburgh Dock, and reconstruction of the quay at the Victoria Wharf.

There will be gradual substitution of electric power in the dock machinery in place of hydraulic power, except in the case of coal-loading appliances.

A scheme of extension at the west side of the port in the area enclosed by the two new breakwaters, recently completed, is also under consideration.

Aerial View, Alexandra Docks, Newport

Newport Docks

A Great Western Railway Undertaking

(CONTRIBUTED)

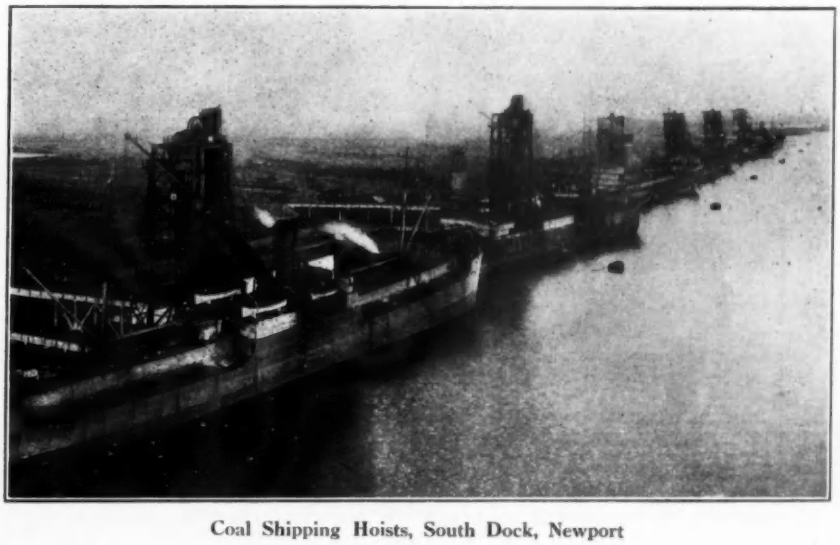
Newport (Mon) owes its importance as a Port to the Alexandra Docks, comprising 124 acres of deep water and equipped with excellent facilities for modern ocean traffic.

Historical

A very distinctive feature is the Entrance Lock, which is 1,000-ft. long by 100-ft. wide, and has a depth on the outer cill of 45¼-ft. at High Water of Ordinary Spring Tides and 35¼-ft. at High Water Ordinary Neap Tides. At the time this Lock was opened on 14th July, 1914, it was the largest in the world, and there are still very few that exceed its dimensions. This Lock was constructed in connection with considerable extensions of the Dock accommodation which were brought to completion at the same time.

The first section of the Alexandra Docks to be constructed, the North Dock, was opened in 1875, and consists of 30 acres of water. The North Dock is joined to the South Dock by a junction 60-ft. wide. The first portion of the South Dock, consisting of about 20 acres, was opened in 1893; a further 48 acres was opened in 1907, and the remaining area of about 26 acres was made available at the same time as the sea Lock Entrance was opened in July, 1914.

The Docks formerly belonged to the Alexandra (Newport and South Wales) Docks and Railway Company, which also owned a Railway extending from Newport north-westwards to Pontypridd in the Glamorganshire Coalfield. The Alexandra Company was amalgamated with the Great Western Railway Company as from 1st January, 1922, together with the other amalgamations which followed the Railways Act of 1921. The Newport Docks therefore come under the judisdiction of the Chief Docks Manager of the Great Western Railway, Mr. Leslie E. Ford, whose Headquarters are at Cardiff, the Company's Dock Manager at Newport, being Mr. J. T. Edmunds.



Coal Shipping Hoists, South Dock, Newport

Newport Docks—continued

Coal Shipment

In common with other South Wales Ports, an important part of the peace-time trade of the Docks is the shipment of coal.

All the coal shipping appliances at the Newport Docks are arranged along the western side of the North Dock and the northern side of the South Dock, while the cranes for dealing with other cargoes are situate on the opposite sides of the respective Docks. Thus, the coal shipping work is kept quite separate from that pertaining to other cargoes, which has been found a most convenient working arrangement.

There are 14 Coal Shipping Hoists at the Docks, 13 of which are capable of shipping wagons containing 20 tons. For dealing with other cargoes, there are 30 hydraulic cranes and 34 electric cranes, together with a number of steam and other mobile cranes. Most of the cranes are 3-tons or 6-tons capacity, while there is one quayside hydraulic crane with a capacity of 30-tons. There are also two 50-ton floating cranes at present in service at the docks. Six transit sheds are placed on the quays of the South Dock for goods pending shipment, or after discharge.

General Trade

In normal times, imports consist of iron and other ores, semi-manufactured iron and steel, timber and deals, pitwood and mining timber and general merchandise. On the export side, besides the large shipment of coal and coke, there are substantial tonnages of manufactured iron and steel, tinplates and general merchandise. The close proximity of the Port of Newport to the Midlands has led to a steady business with that district, both in imports and exports. There are in fact, regular sailings, in normal times, of general cargo vessels to practically all parts of the world.

Altogether, the Port of Newport, is well equipped for a considerable expansion of business, and having regard to the number of varied industrial works in the district producing goods suitable for export, there is a feeling of confidence in the future of the Port.

South Wales Ports

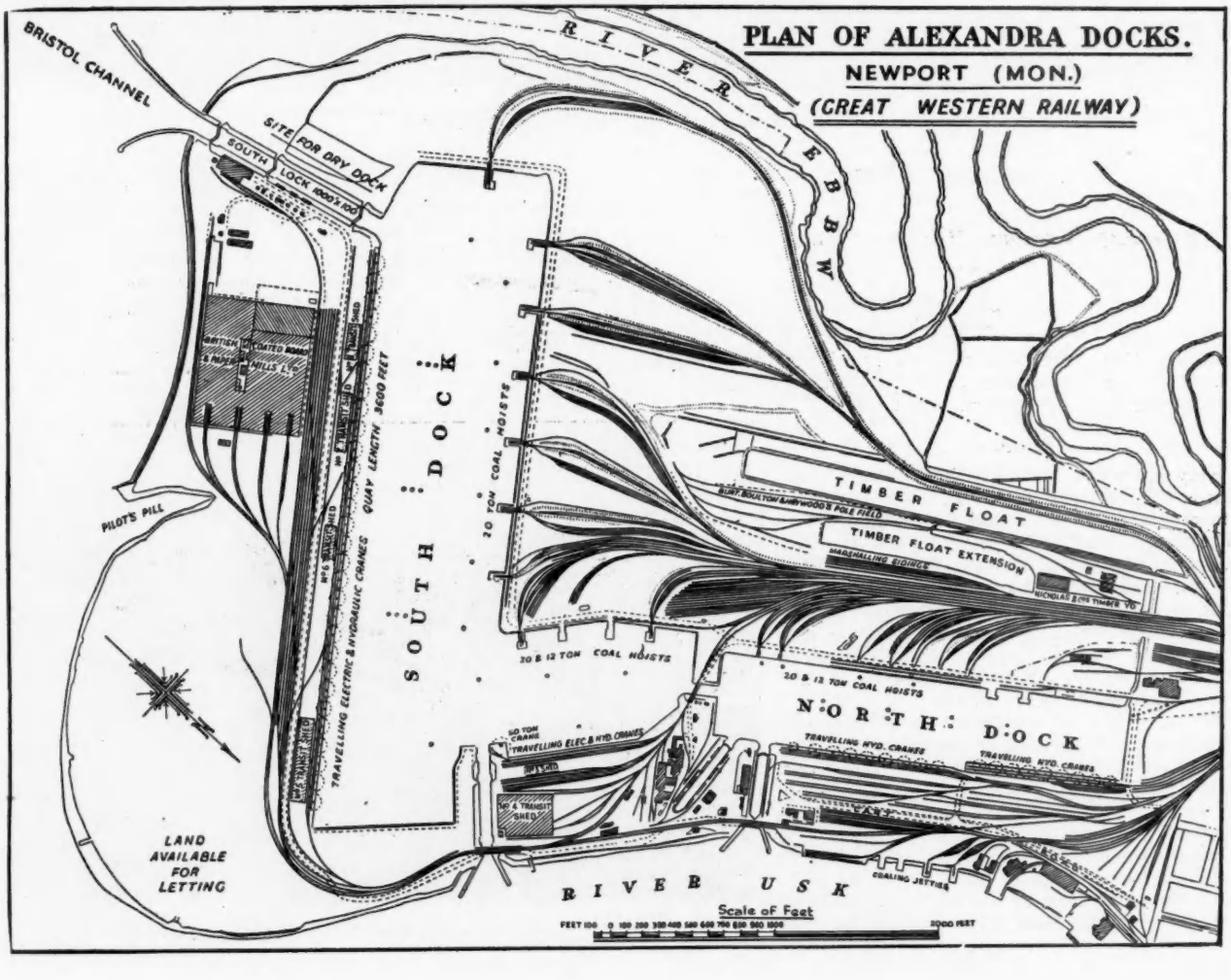
As an appendage to the foregoing description of one of the leading ports in the area, it is appropriate to notice a pamphlet recently issued by the Great Western Railway on the South Wales Ports under their management, dealing with their War and Post-war Development.

The following extracts provide information of general interest.

Influence of Railway Amalgamation

Upon the Amalgamation of the South Wales Railway Companies, following the Railways Act of 1921, the Great Western Railway Company became the Proprietors, as from 1st January, 1922, of the extensive and important Dock systems of Cardiff, Newport, Barry, Port Talbot and Penarth. Swansea Docks came under the Company's control from 1st July, 1923, as the result of a separate Act of Parliament—the Great Western Railway (Swansea Harbour Vesting) Act, 1923. These are the principal South Wales Docks, but the Company also owns smaller Docks at Briton Ferry and Burry Port, as well as the open Harbour of Fishguard, from which, in normal times, passenger and cargo steamers connect with Eire.

From the outset of their responsibility under the amalgamation, the Company pursued a policy of improving and adding to the facilities, and prior to the war had expended some millions of pounds in modernisation schemes at the docks.



Newport Docks—continued

Cargo Vessels at General Cargo Quay, South Dock, Newport

Trade at the Docks

To give some idea of the magnitude of the trade of the docks, in one year, since the last war, 24,000 vessels visited the principal South Wales ports, and the total traffic dealt with in the year amounted to no less than 44½ million tons, made up of 35½ million tons of coal shipped and 9 million tons of other exports and imports.

It must, however, be stated that during the period of depression in international trade the traffics through the South Wales ports fell substantially below the foregoing figures, and the annual total tonnage in the five years before the War averaged just over 25 million tons, made up of 19¼ million tons of coal shipped, and 5¾ million tons of other exports and imports.

Apart from coal shipments, other exports are officially classified under the heads of patent fuel ; iron and steel, rails and ironwork ; tinplates ; cement ; grain and flour ; oil ; and general merchandise. Imports are recorded in the classifications of iron ore ; copper and other ores ; iron and steel (semi-manufactured) ; timber and deals ; pitwood and mining timber ; grain and flour ; oil ; building sand ; and general merchandise.

During the war, owing mainly to the loss of the French and Italian markets, coal exports have substantially dropped ; but the coal shipping appliances have, nevertheless, been maintained in a state of efficiency, so as to be readily available when normal trade is resumed.

Since the war began, many improvements have been effected in the equipment for dealing with cargoes.

The docks, therefore, as well as being ready for the resumption of a greater volume of coal exports, are better equipped than ever for the handling of general cargoes.

The very immensity of the coal export traffic may in the past have tended to overshadow the important fact that, apart from coal, the South Wales ports were constantly dealing with a volume of exports and imports in such great quantities and variety as in themselves to constitute a very substantial general cargo port trade.

War Time Experience

Coming to war-time experience, while it is not permissible to give detailed figures, it can be stated that a large volume of bulk imports and exports continue to be dealt with ; but the quantities of varied traffics, both imported and exported, classed under the official head of "General Merchandise," have been enormous—to the extent of nearly five times as much as before the war, and running into millions of tons a year. For the last complete year before the war, the total of "General Merchandise" imported and exported at the South Wales Docks was 592,000 tons ; for 1943 it was 2,935,000 tons. The docks, have, in fact, been called upon to deal in large quantities with every conceivable type of general traffic, including frozen meat and all kinds of foodstuffs ; railway locomotives and rolling stock ; road vehicles ; heavy and light weapons and munitions ; aeroplanes and parts thereof ; machines of various types ; and miscellaneous goods, either loose or in packages and cases of all sizes, shapes and weights, heavy, medium and light. An infinite variety of commodities of all kinds have thus passed through the South Wales Ports, and, in addition, many passengers have landed or embarked.

These traffics and the ships carrying them have been handled in such a manner as to call forth expressions of appreciation on behalf of the Government Departments and Traders.

20-ton Coal Hoist, Alexandra Docks, Newport

Thus the achievements of the South Wales Ports during the war have conclusively proved that they are capable of dealing with every sort of commodity and compare favourably with any other ports of the country for the discharging and shipment of general cargoes.

The South Wales Sea Board is geographically very favourably situated for the importation or exportation of traffics to or from any part of Great Britain. The communications, both road and

Newport Docks—continued

rail, between the docks and other parts of Britain are admirable.

The maintenance of a good standard of trade through the South Wales Ports has a vital bearing upon the well-being of South Wales as a whole. As an illustration, the amount of wages paid by the Great Western Railway Company for conducting the operating work only of the principal docks in 1943 was £2,500,000, distributed over the ports, approximately as follows :—

Cardiff	£920,000
Swansea	610,000
Newport	510,000
Barry	360,000
Port Talbot	100,000
	£2,500,000

To this must be added £800,000 paid by private stevedores to the transport workers, spread over the ports in very similar proportions. These sums take into account only the various workpeople carrying on the operations of working the docks from day to day, including the loading and discharging of steamers. The figures do not include wages paid to the civil and mechanical engineering departments, nor the wages paid by ship repairers, by ship owners to their crews, riggers and trimmers, nor by multifarious other employers who, in some way or another, are engaged in, or in catering for, the business of shipping.

The disposal of these large sums of money naturally conduces to the general prosperity of the ports themselves. When consideration is also given to the various iron and steel and other manufacturing interests, coal mining, and other sources of employment, dependent to a large degree upon the import and export of cargoes, the good effect upon the prosperity of the whole South Wales District resulting from the maintenance of a high level of tonnages passing through the docks cannot be over-estimated.

The Dock Systems

Particulars of the several dock systems (other than Newport, described above) are as follows :—

Cardiff is probably the most universally renowned port for the shipment of coal. The port also deals with heavy traffics such as importations of iron ore, semi-manufactured iron and steel, pitwood, timber and deals, and exports of patent fuel and manufactured iron and steel. Apart from this, however, Cardiff has always had a very large business in grain and flour and general merchandise, particularly in imports of fruit, foodstuffs, general goods and cattle. Cardiff is one of the few British ports licensed for the importation of cattle from Canada and elsewhere.

The docks have a deep water area of 165 acres ; there are 24 coal shipping appliances and 110 cranes of all types for handling other cargoes. The Great Western Company's 100-ton floating crane is normally harboured at Cardiff, but is available also for use at the other South Wales ports.

The potential capacity of Cardiff Docks can exceed 14,000,000 tons of imports and exports.

Penarth Dock (in the Port of Cardiff) was noted for coal exports, and also had imports of iron ore, raw materials for paper-making and pitwood and mining timber. Penarth Dock has dealt with over 4½ million tons of traffic in a year. Whilst this dock had to be closed to ordinary traffic in 1936, facilities for ship-repairing were continued. The dock was made available for vessels lying up and maintained in a condition to allow of its being used if and when warranted.

Swansea, besides being noted for the shipment of anthracite coal, is also famed as a great metallurgical centre. Tinplates, galvanised sheets and other iron and steel and general metal products are exported in large quantities, for which the necessary iron, copper and other ores and semi-manufactured iron and steel are imported at the docks. A large oil business, both import and export, is also dealt with through this port in connection with the operations of the National Oil Refineries, as well as considerable quantities of general merchandise, patent fuel, grain and flour, pitwood and mining timber and ordinary timber and deals.

As an indication of the potential capacity of Swansea Docks, they could handle in one year in excess of 8,000,000 tons of traffic. The docks comprise 269 acres of deep water, and have 18 coal shipping appliances and 140 cargo cranes.

Barry Docks are famous for the huge quantity of coal shipped in normal times, but also with large imports of grain and flour, pitwood and mining timber, whale oil, petroleum and timber and deals, as well as exports of cement and a quantity of general merchandise both import and export.

The capacity of Barry Docks is over 12,000,000 tons of traffic in one year.

The area of deep water in the docks is 114 acres ; there are 30 coal shipping appliances and ample cargo crane facilities.

Port Talbot Docks are responsible for large shipments of coal, and also handle a very considerable traffic in imports of iron ore, semi-manufactured iron and steel, pitwood, timber and deals and exports of manufactured iron and steel.

As showing the capacity of Port Talbot Docks, over 3,000,000 tons of traffic could be easily be dealt with in a year, or even exceeded.

The deep water area is 67 acres, the coal shipping appliances number 9, and there are numerous cargo cranes.

Briton Ferry and **Burry Port** are smaller docks where coast-wise coal shipments form the main business.

Fishguard is the connecting link between South Wales and Eire, whence in normal times regular passenger, goods and cattle service to and from Rosslare and Waterford are given by the G.W.R. Company's own well-appointed steamers, and to and from Cork by the City of Cork Steampacket Company's vessels. Services for goods and cattle are at present run by the Great Western Company between Fishguard and Waterford, and by the City of Cork Company between Fishguard and Cork.

Correspondence

To the Editor of "The Dock and Harbour Authority."

Dolphins

Dear Sir,

Regarding my article on " Dolphins " in January issue, I have received a request to explain why only a fraction (η) of the lateral energy of a moving vessel is delivered to a dolphin or jetty by the impact of coming alongside. This I have already dealt with in a paper in " Structural Engineer," Vol. XXI, No. 8, which was reprinted in *The Dock and Harbour Authority*, October and November, 1943.

It would appear what is little appreciated is that a vessel waterborne and under control swings more or less readily about her longitudinal centre of buoyancy or the steering centre. When coming alongside a dolphin, quay or jetty, the pilot automatically controls the steering to avoid too severe a blow between ship and the obstruction : at the same time the crew are ready to place cork fenders between the vessel and first point of contact. Thus the blow delivered will be in a direction to assist the helm ; in other words, a glancing blow not driven home, which urges the ship to respond to the steering. Of course, instances may be given where damage has resulted in such operations, particularly in a tide way, but that is usually due to accident. I know of an instance on the Thames where a barge displacing only 150 tons, out of control and carried along by the tide, destroyed several piles of a wharf designed for vessels of 5,000 tons. The barge was undamaged. Now this case is very different from that of a controlled vessel, as the propulsive effort (due to the current) is still in operation on the barge after having struck the wharf.

Unfortunately, in my article, an error of symbols has crept in on page 198, third line from the bottom of first column, where n should read η (Greek letter, eta.): this also applies to Table I. I would suggest a working value of $\eta = 0.5$ for positions more or less free from current and $\eta = 1.0$ for positions subjected to strong currents bearing on the dolphin or jetty.

Yours faithfully,

R. R. MINIKIN.

Bath.

January 30th, 1945.

*Coast Defence against Marine Action**

Problems and Precautions

By PABLO SUAREZ†

THE protection of coasts from the action of the sea has given occasion for complex works which have an imperfect scientific basis. The variation in the local conditions, insufficient experience and the lack of systematic investigation greatly complicate the general treatment. The present article will endeavour by collocation to unite the conclusions arrived at by different engineers from studies and experiments made during a considerable number of years in various parts of Europe and America, with the object of serving for guidance to those who have to undertake the planning of works of this nature.

The article will be divided into three parts.
1. Coastal Regimen; the erosion and formation of beaches,
2. Defence systems, and
3. Outline and structure of defence works.

I. COASTAL REGIMEN :

The Erosion and Formation of Beaches

The natural agencies which contribute to the modification of the costal contour are not solely destructive ; on the contrary, they are, in part, constructive. Among these natural agencies are the movements of the sea and principally wave action, which plays a leading part in the assault on the shore, producing effects of all kinds. It erodes the coast line, assisted in its work by other and atmospheric elements, as well as by geological phenomena of which certain maritime regions are the location. It transports the light material of which the beaches are formed, aided at times by the winds, which unite their influence with those of the waves, the tides and the currents.

From experience it is comprehensible that every coastal defence scheme should be preceded by a detailed investigation of the local conditions and a consideration of the whole of the factors which contribute to the formation of the coast, such as the natural contour, its form and disposition; the action exerted by the waves and by currents of different kinds; by atmospheric moisture and by frost; the origin and nature of the material of which the beach is composed; the quantity of water which discharges on to the beach and the regimen of the outfall of streams ; the situation and regimen of fresh water-bearing strata and the influence exerted by new maritime constructional works which form a salient to the coastline.

A. Cliff Erosion

Steep, rocky cliffs of granite, gneiss or compact limestone are only attacked very slowly. Some of these rocks are protected against wave action between the levels of high and low water by a layer, 5 to 15 mm. in thickness, composed of calcareous shells of living species of the order *cirripedos*, extremely small and very resistant. The disintegration of hard rock by slow degrees is nevertheless inevitable; it is the source of salts found in solution in sea-water; but this is more a subject for geologists than for engineers.

Cliffs formed of friable rock, such as soft or argillaceous limestone are, on the contrary, menaced by the sea; the action of rainfall and frost accelerates their disintegration.

B. Beach Formation

The materials resulting from littoral erosion and from the detritus of rivers charged with solids, undergo constant attrition. The more bulky pieces are rounded fragments and gravel, the product of rock disintegration. The size of the rounded pieces and fragments decreases under the influence of mechanical action on brittle substances, yielding sand and similar material down to an impalpable residuum of fine mud and slime, the ultimate result of the erosion of argillo-arenaceous coasts.

The formation of beaches composed of different materials obeys certain definite laws As a general rule the more bulky materials form the higher part of the beach; deposited by water descending under the action of gravity and recoiling waves, they support low slopes relatively steep. The slope becomes less steep as it approaches sea level and the larger material disappears in favour of gravel and finally, of sand.

The transverse section of a beach of this type in the portion between high and low water, would be formed in its upper part by slopes with gradients between 1 in 3 and 1 in 5 for the bulkier material, followed by 1 in 8 for the gravel, or 1 in 9 for a mixture of gravel and sand, and finally, a very slight slope of 1 in 20 to 1 in 50, and even less, for the sand, this last being extended below the level of low water.

At a higher point of the beach there may be encountered sometimes an accumulation of light materials, which when it attains a permanent character receives the name of *cordon littoral* or coastal belt. The existence of this permanent accumulation is bound up in the relationship existing between the inclinations of the beach and of the adjacent land. When the slope of the latter is less than that of the part of the beach lying within range of the tide, it gives rise to the formation of the coastal belt.

The transported material deposited on the beaches has no permanent character in itself. When the wind is not exactly normal to the coastline, the waves propelled by it break obliquely on the beach and drive the solid material inland in the same direction. The return wave, subject only to the action of gravity, is sensibly perpendicular to the shore line and drags the sand and gravel previously propelled forward to deposit them in the immediate vicinity of the backwash, whence they are again picked up by the following wave to perform an analogous trajectory. The gravel and sand thus travel along the beach in a zig-zag course. Alongside this forward progress, which is effected above low water level, is produced another on the submarine beach which extends from the low water level to the neutral line. This neutral line is that above which a heavy particle, located on the submarine beach, experiences a propulsion towards the coast, and below which the weight component, combined with the effort due to the return wave, exceeds the force of the direct wave. When it is a question of sands subjected not only to wave action but also to the influence of winds and currents, progress is accentuated and results in important modifications of the littoral.

When these products of attrition transported by the waves and currents along the coastal frontage encounter an obstacle which forms a salient to the coastline, they are trapped in the angle between the two. If the supply of drift material is continuous the angle fills up and forms a new concave coastline which invades the sea as far as the extremity of the obstacle which is thus outflanked. At this stage, the products of attrition falling on the other side are taken afresh by the waves and continue their travel along the shore.

C. Dunes

Large stretches of beach subjected to alternations of dryness and wetness are at times accompanied by dunes, of variable height and extent. The dunes are the natural defence of the coast. Quartz sand is the only material which contributes to their formation because it alone is able to withstand the repeated movement of transport. The action of the solar rays on the sand lying uncovered at low water, dries the particles and renders them susceptible to the least breath of wind.

Generally speaking, dune formation requires a very flat beach, less than 40 to 60 metres in breadth, to which the sea continuously conveys fresh supplies of sand. For this reason dune formation

* Translation of Spanish article in *Revista de Obras Publicas*, November, 1944
† Ingeniero de Caminos

Coast Defence against Marine Action—continued

is impossible, as also its conservation, on coasts where no supplies of sand are assured.

Yet, notwithstanding that the sea may supply a sufficient quantity of sand, dunes do not occur along a steep shore fronted by a narrow beach. The wind which blows inshore comes into contact with the vertical face of the cliff and produces eddies in the sand preventing it from settling.

Many dunes travel towards the interior under the action of the wind which abrades the crests and produces an inclined plane of slight gradient, up which the quartzite particles travel to fall on the steeper side of the inner slope. In consequence of these movements, the whole mass of the dune is transported with variable speed, which, on occasion, has reached the figure of 20 to 25 metres per annum, resulting in the subsidence of houses and the burying of entire villages.

In order to avoid such mishaps the engineer in many cases takes steps to fix the dunes, which furthermore serve to defend the coast and the roads bordering on it. It is difficult to plant pine-trees in immediate proximity to the sea. In that part of the dunes in close contact with the beach, it is necessary to sow, first of all, special grass seed (*arundo arenaria*) yielding grass with flexible stalks which spread over the surface and in the subsoil propagate a vegetable layer which consolidates and ultimately forms a kind of superficial matting, preventing the dune from "smoking" under the action of the wind and permitting later the planting of pine trees, firs and tamarinds and even dwarf willows (*salix arenaria*) in suitable situations.

D. Alluvium and Fine Mud

Alluvium represents the ultimate residue from the trituration of silty material under the action of forces which set it in motion. It is kept in suspension in agitated water, but is precipitated in any area where there is sufficient tranquillity. In the end it tends to acquire a compact consistency and is comparable with clay from the point of view of difficulty of extraction.

In deep coastal waters in which a bed of mud is encountered revealed by soundings or indicated on hydrographic or lithological charts, there is given a precise datum for the limit at which wave movement is not habitually experienced and as a consequence where it is no longer violent. The sediment is deposited normally in regular sequence; the fineness of the grains increases gradually and the proportion of sand diminishes from the shore to the open sea and there exists for each locality a limit below which there is no mechanical action on the sea floor by reason of the relation existing between the depth of water H and the height $2h$ of the waves. The geographical arrangement of the coast and current eddies also influence the depth limit but to a less degree.

E. Mechanism of Beach Attack

Beaches are eroded by waves and by currents, combining their action and exercising, the one or the other, a preponderating effect according to circumstances.

[From "Coast Erosion and Protection"] Sea Wall at Les Arros, Bas Médoc [Courtesy of Chas. Griffin & Co., Ltd

The process of attack is as follows: Storm waves excavate the sand from the beach, even, at times, as far as the dunes, which crown it, and transport the material below the level of low water to deposit it at a distance which depends on the violence of the wave. If the sand has not been deposited too far beyond the low water line in a region where wave action may be predominant, or if it is replaced by an equivalent volume arising from the supplies brought by littoral currents, in good weather, the beach is re-formed. If, on the other hand, the excavated sand is withdrawn by the littoral currents before the advent of good weather and the quantity of new material is less than that removed, the denudation of the beach continues and the erosion reaches a dangerous stage.

There can be erosion, however, without the existence of a predominating littoral current. A beach in equilibrium undergoes continuously a process of denudation through tidal action if the winds are not normal to the coastline, and there is occasioned a longitudinal movement of material of the nature indicated in Section B above. When upstream of the part of the beach in question there exists a source of alimentation of material, the same surf waves restore the excavated sand and no change is produced; but if the source of alimentation disappears or there is interposed some obstacle which prevents the arrival of supplies to the portion of the beach under consideration, impoverishment and even complete denudation supervenes without the necessity for violent storms. Such is the case in the construction of shelter works for a port on a beach which ordinarily gives rise to an accumulation to windward and on the other hand to erosion to leeward, necessitating remedial measures.

It can be affirmed, generally speaking, that the littoral current

Coast Defence against Marine Action—continued

acting alone is insufficient to cause the erosion of a beach. Its action is confined in the majority of cases to filling the rôle of transporting agent for sand excavated by waves.

There is finally the case in which no littoral current exists and storm winds are normal to the coastal front. Then the materials forming the beach undergo a constant displacement in the same transverse section.

II. DEFENCE SYSTEMS.

A. Protection of Rocky and Steep Coasts

When the erosion of cliffs takes place exclusively at their bases through wave action, there is no occasion to attach importance to it except in the case of the softer rocks. Artificial protection can be obtained provided the depth of water in front is not excessive, either by the construction of a continuous retaining wall, or a rubble mound of natural or artificial blocks, or again by the construction of wave-breakers at a sufficient distance from the cliff, taking into account, as may be necessary, the natural slope produced by the disintegration of the rocks due to atmospheric agencies.

It is possible in some cases to adopt a natural protection when the products of disintegration fall into the sea without any drawing away, since these accumulate at the foot of the cliff forming a natural barrier of pieces and fragments.

When by their situation and nature, rocky coasts are simultaneously attacked by the sea and by atmospheric agencies of sufficient intensity, there is no possible means in the majority of cases of eliminating, or at least, of diminishing erosion. In such cases, the destruction of the cliff is a natural phenomenon to which the engineer can only offer a futile opposition.

B. Protection of Shingly Beaches

Encountering, generally, littoral belts of shingle at a level lower than high water, the protection of shingly beaches subject to erosion, whether through the effect of waves which draw down the material in a fixed direction, or as a result of a diminution in the supply of shingle, which travels along the coast, ought to be achieved by a conjunction of transverse works, or groynes, and a longitudinal work located in the upper part of the dry portion of the beach.

If there is no preponderant littoral travel of shingle, the defence works need only consist of longitudinal structures, sufficiently robust to withstand the action of waves.

Groynes are located generally normal to the longitudinal work. Their length ought to be the less, the greater the fall of the beach. Generally, a length of 40 to 50 metres is sufficient.

The interval between groynes may be the greater in proportion as the solid material is more important and the concavity of the cross-section of the beach is less marked. It is impossible to lay down any *a priori* rule, except in those cases in which there exist proportionate indications from experiments made in similar circumstances. It is preferable, however, to commence with rather considerable distances apart, of the order of one-and-a-half times to twice the length of the groynes and to increase the number of groynes as the work advances, if this is necessary in view of the results obtained.

The height of the groynes above the part of the beach to be protected or re-formed ought to be the least possible, certainly not exceeding, in any case in the higher part of the beach, .5 to 1 metre above the level of high water.

Longitudinal works may assume the form of a simple revetment if the ground behind consists of sedimentary strata or material not liable to settlement; in the contrary case it is necessary to make the work stable by giving it the form of a retaining wall. Inclined revetments are always preferable if it is possible to construct them.

C. Protection of Sandy Beaches

As regards sandy beaches, it is necessary to distinguish the three following cases: (a) coasts with a predominant littoral current in a fixed direction, transporting a volume of sand, continuously plentiful; (b) coasts with a predominant littoral current not transporting material in suspension, or in very limited quantities; and (c) coasts without predominant current, subjected to the preponderant action of waves

In the first case it may happen that the alternations of good weather and storms produce the effect indicated in Section E of the first part of this article through a combination of circumstances which cause the beach section to be stabilised. If such circumstances do not obtain, the same result may be secured favouring the deposit of sand on the beach through a retardation of the littoral current by means of transverse groynes.

If groynes, however, fail to ensure a sufficient deposit of sand by reason of wave disturbance, a longitudinal work becomes inevitable, generally in the form of a revetment with relatively moderate slope.

In the case of shores with a predominating current which has little or no transportation effect for materials in suspension, if the dry portion of the beach is sufficiently extensive, it may be that the alternations of good weather and storms, with the aid of the wind, will suffice to maintain the stability of the coast; but if the littoral current travels at too great a rate, it will be necessary to retard it by means of groynes sufficiently long for the purpose. If the first condition is not obtained or if the dry part of the beach is not sufficiently sufficiently extensive, it will be necessary to have recourse to longitudinal works, and if at the same time, the coast is subjected to a littoral current, the protective structures should comprise both longitudinal and transverse components.

When it is a question of coasts without predominant littoral current, subject to preponderant wave action, in the absence of any source of material to travel along the shore, or if the preponderant action of the waves is exerted in a direction normal to the shore line, groynes are of no use whatever and the only possible protection is by means of longitudinal works. These can take the form, according to circumstances, of simple sloping revetments over the whole area if the coast is bordered by dunes, or of walls if the beach is entirely submersible, or again of wave-breakers. These last have, over the revetments and paved surfaces, the advantage of supporting the coastline from the attack of the sea, while helping at the same time to raise the level of the beach by means of the sand carried by breaking waves, which mount and fall on the interior of the works or between them and the coastline.

If, on the other hand, there is a sufficiency of material in transport, the protection of the coast can be adequately assured by means of groynes alone. If the supplies are insufficient, or if there is reason to fear that storm waves will beat on the coast in a direction parallel to the groynes, and produce excessive impoverishment of the beach, the protective works ought to include, in addition to groynes, a longitudinal work.

The longitudinal work becomes imperative in every case, where, for any reason whatever, protection has to be afforded in the shortest possible time.

The length of the groynes has to be considered in relation to the slope of the beach and the violence of the waves, the works being extended as far as the limit of the more energetic action of the latter on the sand of the sea floor and arranging them, as in the case of shingly beaches, at right angles to the coastline.

The distance apart of the groynes ought to be related to their lengths, so that the deposit of sand may take place throughout the whole area lying between the groynes, the effectiveness of each groyne depending on the quantity of material arrested, on the obliquity of the waves and in the case of tidal seas on the difference in level between high and low water. Experience has shown that groynes produce the desired effect when spaced at intervals, according to circumstances, of one to one-and-a-half times the length.

In the case of beaches which have to be defended from a destructive current, the groynes ought to be the closer together, the more intense the current and the nearer it is to the coastline.

The height of the groynes must be considered, especially in the area of the beach affected by the range of the tide, so as to accord with the beach profile which it is desired to obtain or which is believed to be obtainable, increasing the exposed margin of the work in accordance with the material collected and maintaining a height of 50 to 60 cm. above the surface of the beach undergoing reconstruction. Below water level the groynes can be horizontal

Coast Defence against Marine Action—continued

with a height which exceeds low water level by about 50 cm., except in the last bay, where, with the double object of assuring, on the one hand, the stability of the head and, on the other, the trapping of sand, they ought to have a downward inclination to a depth of 50 cm. below the level indicated.

Groynes are not, generally speaking, effective unless employed in groups, all attaining the same distance from the shore line. Construction ought to be commenced with the groyne located at the extremity of the part to be protected, in the direction of the travel of the material, at what may be called the extremity of low water.

The construction of a series of groynes ought to be studied, taking account of the impoverishment which is inevitably caused in a portion, more or less extensive, of the coast, in the direction of the littoral drift, mostly near the last groyne. If all the drifting material is trapped by this groyne, no further protection is possible in the section further on, other than a longitudinal defence work. If, on the other hand, the material can by any means reach this part of the coast, protection can be assured by an outer series of groynes installed in some convenient form so as to be in satisfactory accordance with the unprotected beach, and in suitable uniformity with the coastline. With this object in view, the groynes may be constructed either of a length, gradually decreasing in the direction of the drift without variation of level, or by diminishing gradually the height down to beach level without reducing the length.

In the event of alteration of a beach provoked by the construction of a work forming a salient with the sea, with excessive accretion on one side and dangerous erosion on the other, it may be advantageous in certain circumstances to protect the coast against effects both at the same time, by dredging the material in the first zone to deposit it in the second. The occasions are rare in which this procedure is adopted, and in any case the results obtained have to be preserved by defence works.

Also, it may be sufficient in certain cases to prohibit or to regulate the removal of sand along the coastline or in the bed of inflowing currents of water, thereby sensibly reducing, and even avoiding, the impoverishment of the beach.

(To be continued)

Proposed Dockisation of River Hull

Discussion on City Planning Report

The Report and Plan prepared by Prof. Sir Patrick Abercrombie for the reconstruction of the City of Hull was considered by the Reconstruction Committee at a meeting in January.

Opening a discussion on the scheme for dockising the River Hull, **Ald. J. G. Hewett, J.P.,** chairman, said the sub-committee had agreed, without dissentient, to recommend, as this was a technical matter, to employ the finest expert they could find in the country, to give them an unbiased opinion as to what was best to do with the River Hull from a commercial point of view. It was proposed to ask the Port of London Authority and the Institution of Civil Engineers to nominate a qualified man. They wanted a first-class man to advise them before coming to a decision on a matter so important to the city and port.

Professor Abercrombie, in expressing his assent to the proposal, said they were faced with a highly technical question, and as in the case of London and its railways, there were certain things on which as a general proposition it might be felt that further expert advice was desirable. If they adopted the same principle in Hull he would be much happier in his mind.

Ald. F. Holmes said the criticism seemed to have been that the scheme was not feasible.

Councillor H. Harrison replied that the criticism was that it was not practicable from a business point of view. No one had contended it was not practicable from an engineering standpoint, but it would be of no use going to an expert on the engineering side to get to know whether it was practicable or not if they knew from the beginning that from a commercial and financial point of view it was useless. Therefore he thought the first expert they should consult should be an expert who would be able to tell them whether the dockising of the River Hull would be of any use to the port. Before they consulted any engineering expert they should get the opinion of the Shipping Committee of the Chamber of Commerce, the only experts in this matter. It was not a matter of vested interests ; it was for the good of Hull and it would be of no use putting a burden on the city for something that would not be worth while.

Ald. J. L. Schultz pointed out they had received a request from the shipping section of the Chamber of Commerce for a copy of the report of the expert upon which Professor Abercrombie had worked to get data.

Replying, **Councillor Harrison** said it was not altogether a question of finance. Most of those who were in shipping considered it would be far more advantageous to stick to the River Humber so far as dock accommodation was concerned. If they dockised the River Hull, they were going into an undertaking that was out of date before it was started.

The Chairman said he was convinced, as a layman, that the scheme was certainly worth the opinion of an expert, the very best expert they could get. It was too big and too important to the interests of Hull to turn it down.

Councillor Lowthrop asked whether they could be assured they would get a report from every point of view. The most important viewpoint was not the engineering one ; the most important aspect was the shipping and business point of view. He wondered how long the development of the building line and all the other planning was going to be deferred while they waited for the report. By the time they got the expert's report, business people would be utterly fed up and would go elsewhere.

The Chairman thought they could be assured that the experts would not take a very long time. He suggested in order that the matter could be proceeded with immediately that the sub-committee, in consultation with Professor Abercrombie, should find an expert to give a report on the feasibility and practicability of dockising the River Hull.

An amendment by Councillor Harrison that the experts on the shipping side should first be consulted was lost, and the committee approved the appointing of an engineering expert to report on the question.

More Free Port Areas Demanded

Recommendations of International Business Conference

At a conference held at Rye, New York, U.S.A., in November last, an International Business Section debated the question of transportation, commerce and post-war shipping facilities.

Regarding the through movement of cargo, the section proposed the following steps :

1. That additional free port or free zone facilities be created at such points where the goods of the world are distributed, and that these ports and zones be provided with adequate storage and handling facilities.

2. That ways and means be provided for more general acceptance and use of standardised negotiable through bills of lading.

3. That rules and regulations governing international transit be liberalised and standardised.

4. That closer co-operation be attained between the operators of available means of transportation to benefit the movement of travellers and cargo.

5. The present cumbersome procedure in the handling of commercial documents in the consulates of many countries seriously handicaps the movement of goods. It is imperative that this procedure be simplified and, whenever possible, completely elminated. Issuance of consular invoices or other documents is for instance too often merely a pretext for the extraction of additional revenue. If the revenue is necessary to the Government. it should be included in the customs tariff and collected at the port of entry, thus saving time and expense for both the shipper and consignee.

6. That Chambers of Commerce engaged in the promotion of international trade, forwarding agents, and other bodies pertinent to the smooth movement of goods and documents shall resume full operation at the earliest practical opportunity.

Notes of the Month

Death of Member of Port Authority.

The death has taken place, at the age of 61, of Mr. Patrick Belton, a member of the Dublin Port and Docks Board. He was a prominent figure in public life in the Irish capital.

Death of Conservancy Commissioner.

The death has taken place at Sunderland, in his 85th year, of Mr. Septimus Marshall, the oldest member of the River Wear Commission, chairman of its Traffic Committee, and chairman of the Wear Pilotage Committee.

Record Deep-Sea Diving.

A young Swedish engineer, Arne Zetterström, claims that, by using an improved " air " supply method, he has succeeded in descending to a depth below water surface of 110 metres (360-ft.). The previous record, made in England, was 104 metres. The " air " is a synthetic gas of unstated composition.

Mersey Docks Board.

Mr. Richard Poole Silcock has been elected a member of the Mersey Docks and Harbour Board to fill the vacancy caused by the death of Mr. E. G. Brownbill. Mr. Silcock is managing director of R. Silcock and Sons, Ltd., Liverpool. He took a degree in law at Oxford University in 1928.

Bombay Docks Catastrophe Awards.

The *London Gazette* has announced several awards for gallantry in the Bombay Docks Explosion, which killed 731 persons, injured 2,408, made 13,000 homeless and caused millions of pounds worth of damage. Mr. William R. G. Brew and Mr. Leslie J Hall have been appointed M.B.E. ; Sub-Inspector William E. Greene received the George Medal, and Mr. Joseph A. Fernando the B.E.M.

Tees Conservancy Finances.

The budget of the River Tees Conservancy for the past twelve months, as presented to the Board by Mr. R. Wilkinson, the chairman, shows a surplus of £8,088. In presenting the accounts, Mr. Wilkinson said that the position was much better than had been anticipated a year ago, adding : " we still have a great deal of leeway to make up, even with the 100 per cent. increase in river tolls, etc. Our net revenue from that source is little more than 16 per cent. above the comparative figure for 1939." A sum of £10,810 more had been expended on the maintenance of the waterway during the year.

Death of Former Port Manager.

The death is recorded at the age of 79 of Mr. Frederick Humble, who was closely associated with the Port of Sunderland for a period of 39 years. After service in a subordinate capacity, he was appointed general manager to the River Wear Commission in 1912 and general manager and clerk in 1920. He retired at the outbreak of the present war, but his services were retained in a consultative capacity. At the close of the last war, Mr. Humble took an active and important part in the reconstruction of the River Wear Commission, bringing it into closer connection with the Corporation of the town.

The Institute of Transport.

A meeting to commemorate the twenty-fifth anniversary of the first meeting of the Institute of Transport is to be held on March 22nd at 5.30 p.m. at the Institution of Civil Engineers, Great George Street, London, S.W.1. The first meeting of the Institute was held at the Institution in 1920, when the late Sir Eric Geddes delivered his first Presidential Address. On that occasion the inauguration of the Institute was welcomed by the President of the Institution and at the Commemorative Meeting there will be a similar official welcome by the present President. The Commemorative Address will be delivered by Sir Cyril Hurcomb, K.C.B., K.B.E., Past President of the Institute.

Tyne Improvement Commission.

At a recent meeting, the Tyne Improvement Commissioners decided to dismantle a coal staith at Tyne Dock, which is infrequently used, in order to utilise the timber in the structure for repairs and other purposes.

Shetland Harbour Development.

Applications for new piers or extensions and improvements of the existing structures, from the Islands of Yell, Foula, Fronda and Bressay, and also from Walls of Cunningsburgh are being put forward by the Shetlands County Council to the Department of Agriculture for maximum grants of 100 per cent.

Middlesbrough Port Prospects.

At a recent meeting of the Middlesbrough and District Association of Chartered Shipbrokers, the President, Mr. A Harrison, said that during the war the port had handled more general cargoes than ever before. Granted improved port facilities and reasonable costs, there was no reason why they should not be able to retain some of the general cargo trade and also be able to deal with heavy goods as well as any other cargo which might become available as a result of new industries.

Experimental Models of Tay Estuary.

As a result of a conference by their General Manager and Engineer with Professor Gibson and Dr. Allen of Manchester University, the Dundee Harbour Trust has decided to commission the making of experimental tidal model tests of the River Tay before carrying out the proposed extension scheme at the port. The model, it is stated, will take nine months to construct and will be followed by 12 months of operation. The estimated cost of the experiments is £10,000 and expenditure of this amount has been sanctioned ; the work is being put in hand forthwith.

The Institution of Civil Engineers and Air Transport.

In view of the importance which Civil Air Transport will assume after the war, the Council of the Institution of Civil Engineers have decided to form a sixth Engineering Division to be known as the " Air Transport Division," to deal with such aspects of Air Transport as airports (land and sea), airfields, operational buildings and facilities, hangars, and signalling and other appliances in connection with safety in flying. Until such time as a fully-constituted Divisional Board has been elected, Mr. M. G. J. McHaffie has been appointed the Chairman of a provisional Board.

Appointment of Newcastle Quaymaster.

In consequence of a request by the City Engineer of Newcastle to be relieved of the duties of quaymaster, which he has discharged for the past three years, but now finds incompatible with his civic functions, Mr. J. Whitfield, deputy quaymaster, has been promoted by the Newcastle Corporation to the higher position. The Corporation controls and operates nearly two miles of quayage, including several deep-water berths capable of accommodating large cargo liners. The trade of the port has been in the past largely with America, the Dominions, and the Continent of Europe, including the Scandinavian countries. It is hoped that it will be revived and extended after the present war.

Aberdeen Town and Port Development.

The Aberdeen Harbour Board was represented at a recent conference called by the Aberdeen Chamber of Commerce, to discuss the formation of an industrial board designed to promote the post-war development of Aberdeen. Mr. T. M. Rankin, president of the chamber, was in the chair. Captain S. Allan, convener of the Chamber's Post-war Development Committee, said the Committee were of opinion that the harbour should be scheduled as a United Kingdom port, instead of a non-United Kingdom port and should be able to work on similar lines to Leith. A resolution was passed recommending that steps be taken without delay to form a development board and that a Committee be formed to draft its constitution.

The New Breakwaters at the Port of Leith

Preliminary Model Tests for Design

By J. DALGLEISH EASTON, M.Inst.C.E.*

(Concluded from page 216)

PART II.

We now come to the second series of experiments, the purpose of which was to investigate the penetration of the waves into the harbour and to find the best possible arrangement of the pier-heads to give the least penetration.

The data applying to the experiments just described apply equally to the one about to be described.

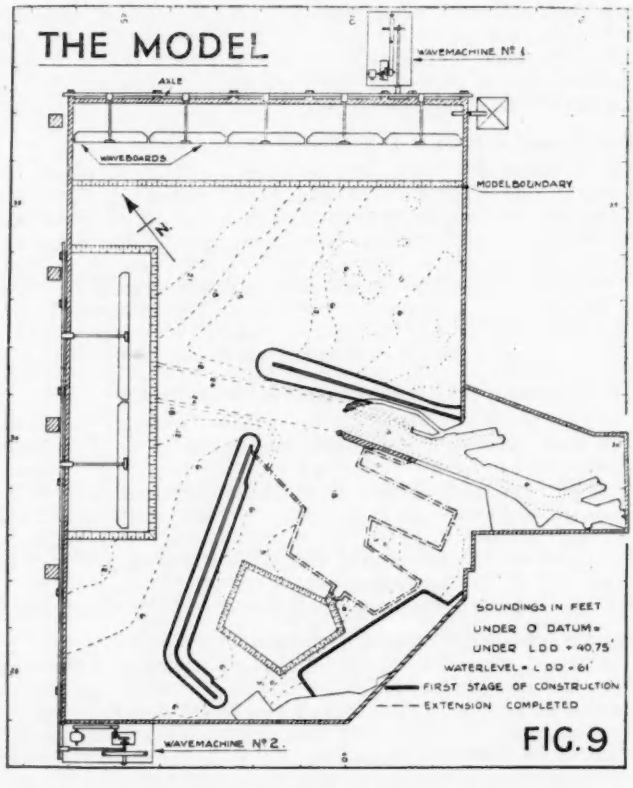


FIG. 9

Observations inside the existing harbour during storms were made at Leith in order to check similar observations on the model and certain requirements were agreed upon before the experiments were commenced. These requirements were (a) the new harbour should not be less tranquil than the existing harbour, (b) the greatest height of waves alongside quays during maximum storms should not exceed 2-ft., (c) any alteration to the positions of the two pierheads should always be such that a ship could enter and leave in an approximately straight line, and (d) the bottom width of the entrance channel should be 400-ft.

The maximum wave at Leith comes from a direction of 50½° East of North and has a height of 13½-ft. From observations carried out at Leith, however, it was found that the waves approached the harbour from a direction 37½° East of North. Although it is questionable if the maximum wave can approach from the direction of 37½° East of North, it was considered advisable to bo on the safe side and assume this could happen, as the farther round to the north the wave approach was applied in the model, the greater would be the disturbance in the harbour, as the waves would enter more directly.

The waves from the north-west which would approach almost in a direct line to the harbour entrance were found to have a height of 7-ft. with a wave length of 126-ft. and period of 5 seconds, owing to the short fetch between Leith and the Fife coast.

The model of the harbour was built inside a tank about 45-ft. by 28-ft., constructed of brickwork on the concrete floor of the laboratory (Fig. 9). The sea bottom was made of rubble and sand covered with a layer of cement mortar, but the bottom of the harbour was of sand only, to facilitate modification of the layout. The required depths were obtained by laying strips of copper forming contours and the sand forming the bottom was modelled up to these.

The coast, piers and breakwaters were modelled in cement mortar, but the new quays in the harbour were made of wood so that they could be placed and removed easily.

At the two places where the wave-making boards were situated, the depth of water in nature was about 40-ft. and as this corresponded to about 7 centimetres in the model, the depth was too small to produce regular waves. The floor of the tank at these places was, therefore, lowered to a depth of 18 centimetres.

The wave-making machine consisted of a motor coupled to a flywheel giving an oscillating rotation to an axle by means of an eccentric and the period and amplitude of the rotation could be regulated. The wave boards were hinged to the foundation plates with their upper ends attached to the axle by means of push rods which caused the boards to swing.

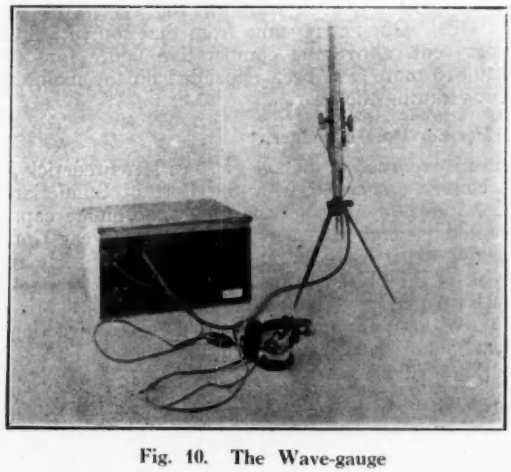
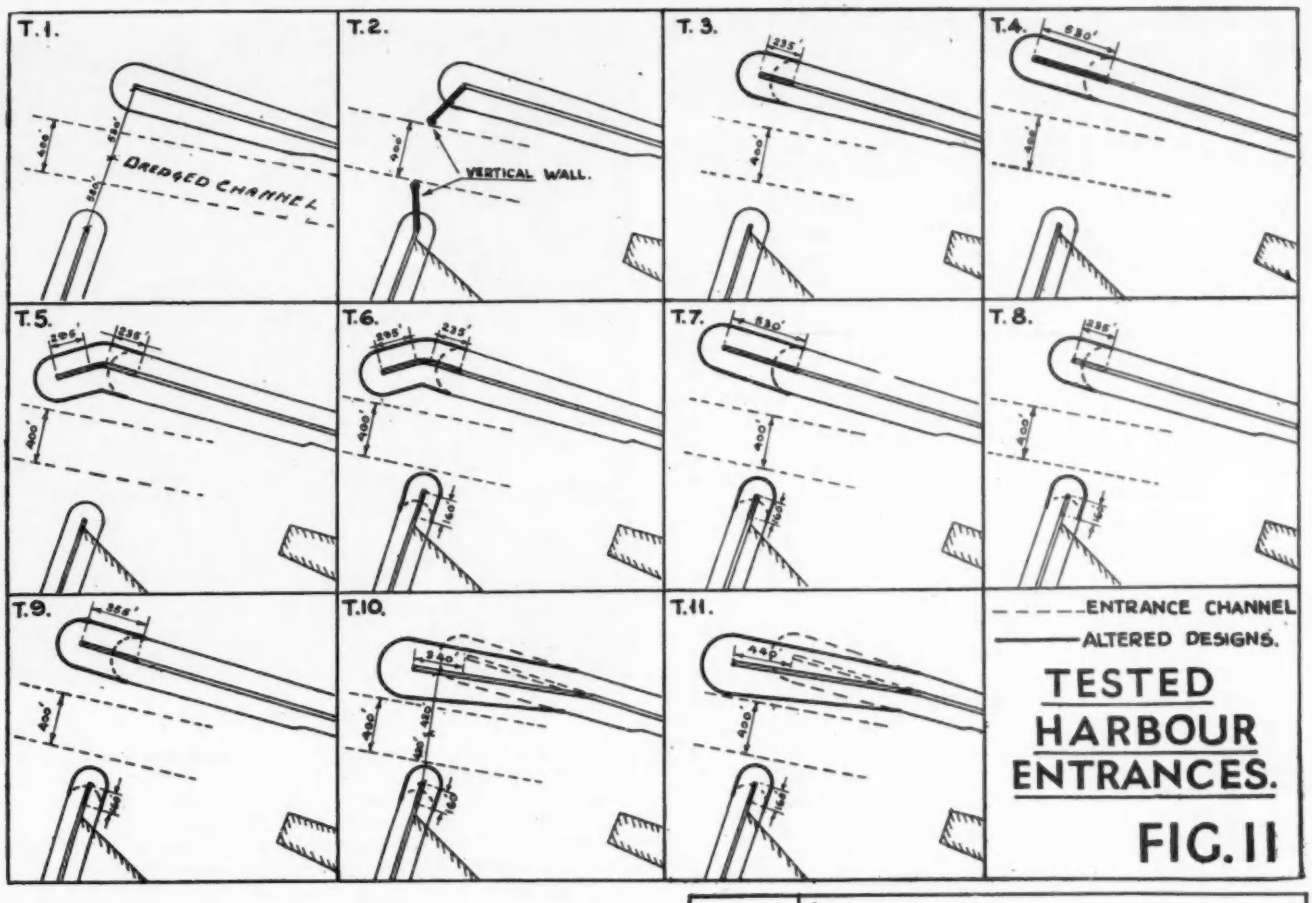


Fig. 10. The Wave-gauge

The length and height of the waves depend on the period and the amplitude of the motion of the main axle. The period could be regulated by the number of revolutions of the motor and the amplitude could be changed by the eccentric setting. The push rods were fitted with ball and socket joints at both ends, so that the direction of the boards and consequently the waves could be varied. In order to prevent reflection of the waves against the south-west boundary of the tank, a slope of sand was laid down on which the waves could break and thus be absorbed.

*Chairman's Address to Edinburgh and District Association of the Institution of Civil Engineers, 11th October, 1944.

New Breakwaters at the Port of Leith—continued



Inside this brickwork tank the model of the harbour works was constructed to as large a scale as the size of the tank would allow, which was 1:180. On this scale, the maximum wave of 13½-ft. outside the harbour measured 2.3 centimetres.

During the tests the following measurements had to be constantly taken:—

1. The water level representing the state of the tide.
2. The wave period and height outside the harbour and the wave height inside the harbour.

The water level was measured by a gauge placed on a slope of 10:1 which gave great accuracy. The period of the wave was measured by a stop watch and the height by means of an instrument known as a differential gauge needle. This instrument (Fig. 10) consists of two needles so arranged in a container that they can slide up and down independently of each other. The container has a scale and verner attached at the side so that the difference in height of the two needles can be measured with great accuracy. Attached to the instrument is an apparatus which produces sound and this is so arranged that the pitch and strength of the sound is different when one needle, two needles or neither of the needles are touching the water. The container with the needles is mounted on a small tripod.

The observer listens by means of a headphone and adjusts the needles in such a way that the desired succession of tones is heard. In these tests the needles were adjusted so that about 10% of the total number of wave troughs were lower than the trough needle and the same percentage of crests reached the crest needle.

All the observations were made by the same person and always during the periods of the higher waves.

After the wave machine had been adjusted to the wave height required and set in motion, a number of wave heights both outside and inside the harbour were measured. It was found that, as a result of reflection from the breakwater and the difference in depth of water, the wave heights outside the harbour were not equal anywhere, so that an area to the north of the east breakwater where the waves were not disturbed was chosen and the waves in

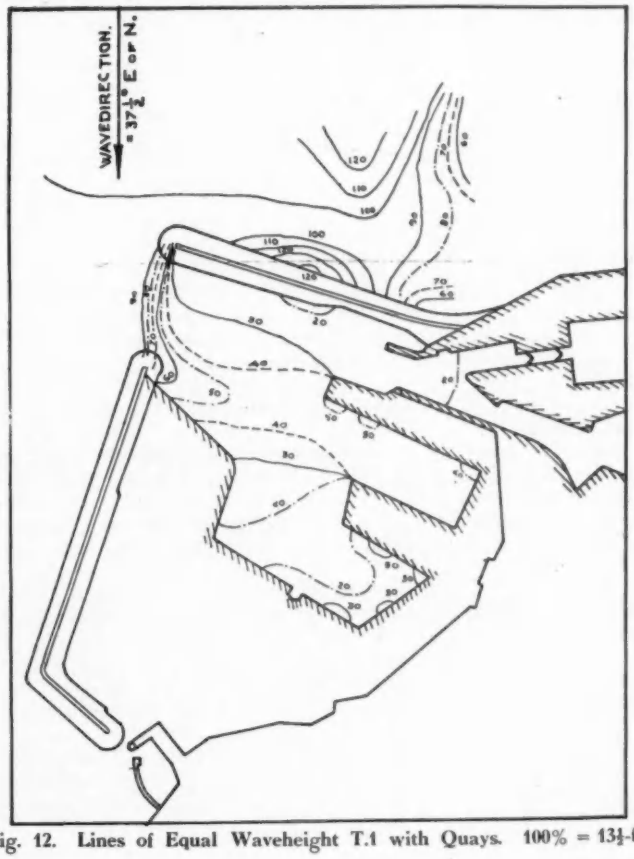


Fig. 12. Lines of Equal Waveheight T.1 with Quays. 100% = 13½-ft.

New Breakwaters at the Port of Leith—continued

this part were taken as the standard 100% wave and all other wave heights are expressed as a percentage of this height.

The results of the tests for each model were shown on the plans by lines of equal wave height relative to the standard 100% wave and two examples of these are given in Figs. 12 and 13.

Fig. 11 shows plans of the eleven arrangements for the harbour entrance which were tested and the following are the results of the tests:

(T1). This was found to be satisfactory until the harbour quays were added, when it was found that the quay running out from the west breakwater caused reflection of the waves entering the harbour, which in its turn caused disturbance throughout the harbour.

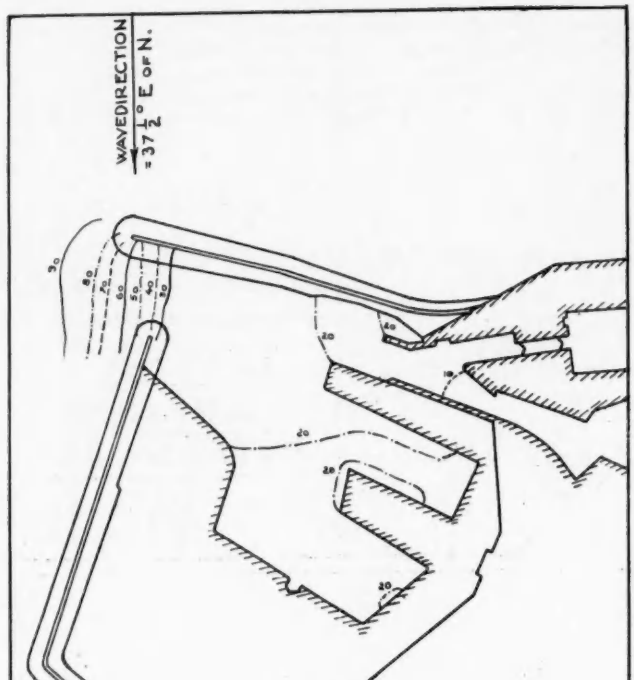


Fig. 13. Lines of Equal Waveheight T.10. 100% = 13½-ft.

(T2). An endeavour was then made to narrow the entrance by erecting screens, but the disturbance continued although reduced.

(T3). The east breakwater was extended by 235-ft., but this was not sufficient.

(T4). A considerable improvement was observed when the east breakwater was extended by 530-ft., but it is still unsatisfactory, as the waves, although they do not enter direct, still strike the quay projecting out from the west breakwater and reflect.

(T5). The bending of the east breakwater head made little difference.

(T6) It was then decided to try if lengthening the west breakwater would improve matters and it was, therefore, lengthened by 160-ft., which was the maximum increase that could be allowed and at the same time retaining the bent east head. This proved satisfactory, as the reflection observed in the previous test now disappeared. The bent head, however, was considered objectionable.

(T7) This arrangement returns to the straight east breakwater with an extension of 530-ft., but retains the extension to the west breakwater of 160-ft. This layout was very satisfactory, but it

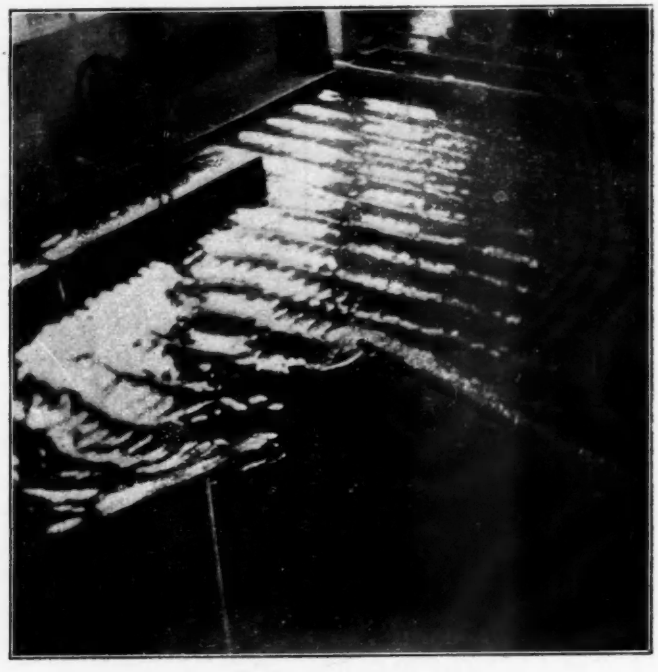


Fig. 14. Waves from North-East

was felt that a total increased length of breakwaters in the deeper water amounting to nearly 700-ft., would be rather expensive and it was decided to find if a reduced extension of the east breakwater would give results which could be accepted.

(T8). This shows an east breakwater extension of 235-ft., but it was not satisfactory, the wave heights along some of the quays exceeding 30%.

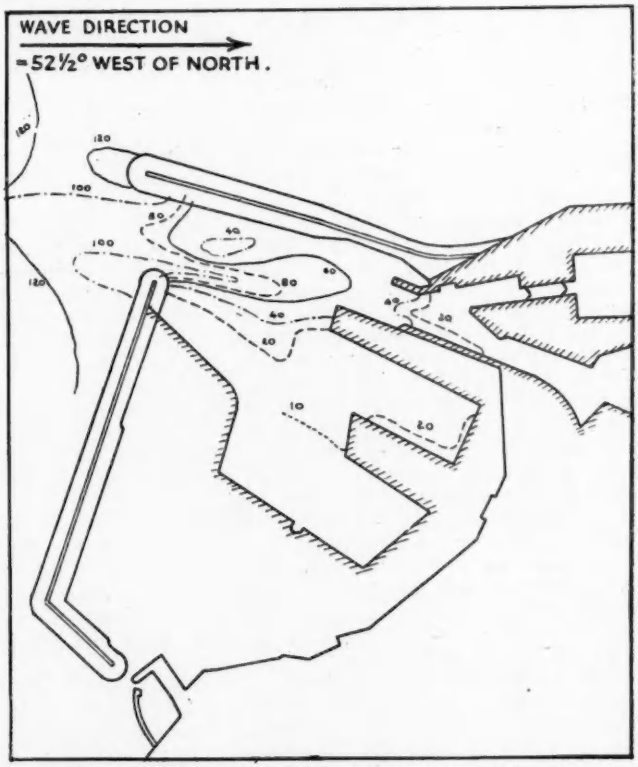


Fig. 15. Lines of Equal Waveheight T.10. 100% = 7-ft.

New Breakwaters at the Port of Leith—continued

(T9). This has an extension of the east breakwater of 355-ft., which was an improvement but not quite satisfactory.

(T10). It was then decided to make a long bend in the line of the east breakwater to bring it parallel to the line of the entrance and so reduce the width of the entrance from 960-ft. to 840-ft. The extension of the east breakwater was fixed at 340-ft. This, even with a shorter east breakwater, was better than T9.

(T11) Is the same as T10, but with the east breakwater extension increased to 440-ft. The slight improvement gained was not considered to be worth the extra cost involved.

It was, therefore, decided, taking cost into consideration, to adopt the layout shown on T10 and the breakwaters have been constructed to this arrangement to the satisfaction of the pilots and shipmasters using the port.

Before finally completing the tests, it was considered advisable to have one other test with the waves approaching the harbour mouth from the north. The result of this shows that, with the wind from the north and the smaller waves entering the harbour entrance direct, the disturbance was less than half the disturbance shown in T10. This is shown in Fig. 15, but it should be noted that the maximum wave height, in this case, is 7-ft.

I think you will agree with me that these scale model tests amply repaid the time and money expended on them and I look forward to the time when our own Government will provide laboratories similar to those at Delft, where engineering problems can be carefully investigated and solved before Public Works, which involve a large expenditure of money, are carried out.

The Bombay Port Catastrophe

Issue of Second Report by Commission of Inquiry

The Commission appointed to inquire into the cause and circumstances of the series of disastrous explosions, accompanied by an outbreak of fire, at the Bombay Docks on April 14th, 1944, has issued its second Report. The substance of the first Report was given in the issue of this Journal for October last.

The signatories of the Report are Sir Leonard Stone, O.B.E., Chief Justice of the High Court of Judicature at Bombay (President), Mr. S. B. Davhle, I.C.S. (retired), formerly Puisne Judge of the High Court of Judicature at Patna, together with Captain E. M. Bayfield, R.I.N., formerly Naval Officer-in-charge, Karachi, who has replaced Rear-Admiral C. S. Holland, a former member.

The earlier report dealt with the sequence of events affecting the ss. *Fort Stikine*, where the explosions and fire originated. The second report covers the wider area of the dock system, and the methods adopted to prevent a spread of the conflagration. The areas involved were the Alexandra Dock, Carnac Bunder and Rice Market, Victoria and Prince's Docks, the oil installations, Carnac Bunder Goods Depot, the Godowns, Wadi Bunder Goods Depot and the residential area.

Five principal dangers were present, it is stated, and the task involved was to avert them.

(1) The danger of the fire spreading into Alexandra Dock, in which there were three ships with explosives and ammunition on board, one ship, full of petrol, moored alongside the sea wall at No. 18 berth, and five sheds, viz. : Nos. 6, 5, 3, 2 and 15, filled with category C explosives ;

(2) The danger of the fire spreading westwards across Mahomedali Road and involving the City of Bombay ;

(3) The danger of the fire spreading from the Prince's Dock or from the Godown area or from Wadi Bunder goods depot and involving the oil installation area ;

(4) The danger of the fire spreading to ships and sheds in Prince's Dock and Victoria Dock, involving the loss of valuable ships and stores not either destroyed or set on fire by the explosions ;

(5) The danger of the fire spreading in the Godown area, involving the destruction of large quantities of foodstuffs and stores contained in this area.

There were 16 merchant ships in the Alexandra Dock at the time of the first explosion ; these and an oil tanker berthed at the sea wall, were removed to places of safety.

The threat to the oil installations was never really serious, becaus it was not allowed to develop. An efficient and properly organised system and staff were available to deal with the emergency.

The Prince's and Victoria Docks were virtually abandoned during the whole period covered by the report. Except for some unofficial efforts at fire-fighting, the fires continued to spread unchecked on board the ships and in the sheds, thereby destroying much property, valuable in itself and, in many cases, of great importance to the war effort. The salient reason why so little was done was that incorrect deductions were drawn from early appreciations of the situation.

It was agreed by competent official witnesses that the two tasks involving the first priority were the prevention of the spread of the fires to Alexandra Dock and the prevention of the spread of fire across Mahomedali Road ; and the Prince's and Victoria Docks, accordingly, were abandoned in favour of the two priority tasks. These two tasks were undertaken and accomplished, but, states the Report, the question remains whether, with the man power available, more could not have been done than was actually achieved. There were 211 pumps in Bombay in working order, many of them with trained crews, which never came into action at all. Altogether, and as a maximum, 138 pumps came into action, this figure including all the pumps of the Fire Brigade Service not destroyed by the first explosion, 43 military pumps, 15 naval pumps, and 5 R.A.F pumps, with one additional pump brought by a party of the Royal Indian Navy from the *Akbar*, a distance of about 19 miles.

In commenting on the affair as a whole, the Report states that the predominant characteristics of the situation, resultant upon the failure to avert the first explosion, were initial surprise and the absence of any generally recognised centre of control or any pre-arranged plan. This was followed by the lack of any accurate appreciation of the problem as a whole. The legal powers of the Fortress Commander and the Commissioners of Police, given under the Defence of India Rules, were hedged about with restrictions which prevented them from becoming operative and the wide powers of the A.R.P. Controller were only legally exercisable in the case of " hostile attack." In the opinion of the Commission, the root of the trouble was the absence of a supreme authority, who could issue operational orders, which it was too late to set up after the emergency had occurred. It is the opinion of the Commission, that the tireless and courageous efforts of the man power available could have been more effectively employed if there had been set up in advance of the emergency a recognised centre of control with a Commander invested with supreme powers and known in advance to all the Fighting and Civil Services.

In a final word the Commission pay a well-deserved tribute to the fire combatants. " The criticism in this our Report of wasteful and disjointed action must not be allowed to detract from our high appreciation of the magnificent individual and collective effort of many thousands of the citizens of Bombay and men and women of all Services and in every walk of life and in every class of the community in the face of a great and common danger."

Although not mentioned in the Report, it may be added that the Victoria Dock is once more in commission, the necessary repairs and reconstruction work having been completed.

Death of Former Mersey Docks Official.

We regret to have to record the recent decease of Colonel T. H. Hawkins, C.M.G., formerly assistant general manager of the Mersey Docks and Harbour Board. Col. Hawkins joined the Dock Board in 1919 as an additional assistant to the general manager, was made principal assistant two years later, and in 1933 became assistant general manager, holding that post for five years, until he retired. During his visits to Australia and New Zealand in 1922 and 1923, Colonel Hawkins did much to further the interests of the Port of Liverpool, and four years later represented the Docks Board at the International Cotton Conference at Cairo and Alexandria. He was made a C.M.G. for his services on the Port and Transit Executive Committee during the last war.

The Dock and Harbour Authorities' Association

Annual Meeting

The Annual Meeting of the Dock and Harbour Authorities' Association was held in London on February 14th with **Sir Frederick J. West, K.B.E.,** the president, in the chair. It was preceded by a special meeting called to consider the report of the committee appointed to consider the subject of post-war organisation of docks and harbours. The committee's report was accepted and was referred to the Minister of War Transport for approval.

In his address from the chair **the President** began by mentioning the fact that the Association had celebrated its jubilee last year. He then referred to the War Damage Bill, and expressed the hope that the representations made by the Executive Committee to the Ministry of War Transport and the Treasury with regard to the contributions demanded under the Bill from dock and harbour authorities would meet with success.

The president also desired to place on record the sincere appreciation of the association of the services rendered by the Parliamentary Committee, the secretary and staff of the association, and their legal adviser. He could assure the members of the association that their interests had been carefully watched.

Executive Committee's Report.

In presenting the report of the executive Committee for the past year, **Col. J. G. B. Beazley** also referred to the 25th anniversary of the foundation of the association. Commencing in a small way 25 years ago it had grown continuously so that with the advent of the railway companies who joined last year their membership was now 73. The association was complete representative of the public harbours and docks in the United Kingdom.

The question of war damage, said Col. Beazley, was dealt with very fully at the last meeting; it was not mentioned in the report because the Government Bill dealing with war damage had not yet been introduced, nor could they see any prospect of the Bill being brought forward in the near future.

Members had been informed of its decisions on the interpretation of the arrangements which had been reached.

Regarding the Town and Country Planning Order, Col. Beazley had no intention of saying anything on the subject of post-war organisation. Members had already heard a great deal about in the course of the preceding meeting, but he wished to say how very grateful they were to the president for the great interest he had taken in the work of the executive committee on this subject.

The report of the executive committee and the accounts were unanimously adopted.

Election of Officers and Committee

The re-election of Sir Frederick West as President was proposed by the Rt. Hon. Thos. Wiles, chairman of the Port of London Authority and seconded by Mr. J. G. Merriweather, of Preston.

After Sir Frederick had returned thanks for his election, the vice-presidents were re-elected. These are Lord Ritchie of Dundee; Sir Ernest Herdman, Belfast; Sir Alfred Read, Ardrossan; Sir Arthur M. Sutherland, Tyne; Sir Thomas A. L. Brocklebank, Liverpool, and Alderman A. W. S. Burgess, Bristol.

Major Basil Nield, M.P., was elected Parliamentary chairman.

The executive committee for the ensuing year is as follows: Mr. J. K. McKendrick, North-East Coast of England; Alderman B. O. Davies, East Coast of England; Mr. L. H. Bolton, London District; Mr. H. A. Short, South Coact of England; Mr. R. H. Jones, Bristol Channel; Sir Thos. A. L. Brocklebank, Bart., Liverpool and N.W. District; Mr. Leslie Roberts, Manchester Ship Canal; Mr. William Cuthbert, West Coast of Scotland; Sir John H. Irwin, East Coast of Scotland; Mr. M. J. Watkins, Northern Ireland; Sir James Milne, G.W.R.; and Sir Charles H. Newton, L.N.E.R.

Executive Committee's Report

The following is the Report of the Executive Committee for the year ended 31st December, 1944, as presented to the Association at the Annual Meeting:

The Committee present the Twenty-fifth Report of the Proceedings of the Association.

It is interesting to note that in common with the Institute of Transport the Association celebrated its Silver Jubilee in 1944, the resolution to form an Association having been passed at a meeting in London in December, 1919, under the Chairmanship of the Rt. Hon. T. P. O'Connor, M.P. At a further meeting in July, 1920, the Constitution and Rules were passed and adopted, and the Docks Committee, with the late Sir Hugh Bell as Chairman, which was in existence at that time, was elected as the first Executive Committee of the Association.

At the time of the first Annual Meeting in February, 1921, there were 34 members, and this number has increased to date to 73, counting the numerous docks and harbours of the four Amalgamated Railway Companies as only four units.

Meetings

The last Annual Meeting was held at the Dorchester Hotel, London, W.1, on the 23rd February, 1944.

The Executive Committee have met three times and Sub-Committees four times during the year.

Twelve Circulars on various matters, including an Interim Report in June, have been issued to Members.

It will be appreciated that travelling and other difficulties during the year very considerably restricted the number of meetings.

Members

The under-mentioned Ports joined the Association during the year: City of Truro; Caernarvon Harbour Trust.

Executive Committee

The Committee appointed Colonel J. G. B. Beazley (Mersey Docks and Harbour Board) for the fourth successive year as their Chairman. Sir John H. Irvin (Aberdeen) took the place of Mr. Hugh Rose (Leith) as representative for the East Coast of Scotland.

Sub-Committees

A list of Sub-Committees for 1944-45 is set out in last year's Report.

Bills in Parliament

The under-mentioned Public Bills were considered:

	Royal Assent
Finance	July 13th
Herring Industry	August 3rd
Rural Water Supplies and Sewage	July 27th
Town and Country Planning	Nov. 17th
Reinstatement in Civil Employment	March 21st
Pensions (Increase)	May 24th

Bills Pending

Wages Council.
Local Authorities—Loans.

Town and Country Planning

An Inter-Departmental Committee under the Chairmanship of the Solicitor-General was set up early in the year to consider and report upon the relations between statutory undertakers and planning authorities, and to make recommendations. This Committee was asked to treat the matter as one of urgency so as to allow of the introduction of the Town and Country Planning Bill during the Session.

The Association's Parliamentary and General Matters Sub-Committee submitted observations to the Committee, and representatives attended on the 17th March and supplemented this statement orally. The Sub-Committee's memorandum, which was approved by the Executive Committee, is set out in full in the Appendix hereto.

The Inter-Departmental Committee in their Report recommended four basic safeguards for statutory undertakers as follows:

1 That it should be open to statutory undertakers to be dealt with ministerially instead of by local Planning Authorities.
2 That any decisions regarding statutory undertakers should be taken jointly by the Minister of Town and Country Planning and the Minister responsible for the statutory

Dock and Harbour Authorities' Association—continued

undertaker (e.g., in the case of docks and harbours the Minister of War Transport).

3 That in certain circumstances statutory undertakers should be able to challenge such decisions in Parliament by a simple and swift procedure.

4 That there should be—

(i) proper compensation (including reinstatement where necessary or in the case of requirements to execute works) and proper financial facilities;

(ii) relief from any statutory obligations, the performance of which has been made impossible.

Town and Country Planning Bill

This Bill, which was introduced in June, received the Royal Assent on the 17th November.

Part I of the Act, generally speaking, empowers Local Planning Authorities to acquire by a simplified procedure land in areas of extensive war damage which needs laying out afresh and redeveloping, and also land in areas of bad lay-out and obsolete development.

Part II amends the law as to compensation for the acquisition of land for public purposes, and Part III contains general provisions.

The provisions of Clause 11 (modifications as to procedure and compensation for purchase in case of land held for the carrying on of statutory undertakings), now Section 13 of the Act, defines land in terms which it was thought would raise difficulties, particularly in the case of land held by public utility undertakings for eventual use.

Steps were taken to get support for an amendment set down to clarify the definition, and representatives of statutory undertakers, including several from the Association, attended a meeting at the Ministry of Town and Country Planning, with the Solicitor-General in the Chair, and explained the difficulties.

The Government, however, would not alter the wording of the clause, which it was stated had been carefully considered, and in cases of doubt reliance will have to be placed on the Minister of War Transport supporting any representations made by Dock and Harbour Authorities to the Minister of Town and Country Planning.

The Act does not extend to Scotland or N. Ireland.

Town and Country Planning (Interim Development) Order

The Ministry of War Transport consulted the Association with regard to the draft of the above Order.

A number of the suggestions put forward to amend the Schedule to the Order with the object of preventing interference with the development of their own undertakings by Dock Harbour and Canal Authorities were accepted. The Order has not up to the time of writing been settled finally and laid before Parliament.

ARRANGEMENT WITH THE GOVERNMENT, 1920.

Government Traffic (Dock Charges) Committee

The Dock Charges Committee held one meeting during the year, and Circular No. 590, dated 19th September, informed Members of the decisions reached.

Preliminary consideration was given to four cases which concerned members of the Association, arising out of Clause 4 of the Arrangement, which is as follows: "If during a time of national emergency the Admiralty or the War Office, by the constitution of works or by other services at a port, perform services which are of value to the Authority at that port, they may set off the value of such works or services against any payment due to such Authority under the Arrangement."

As a result of a detailed consideration of these cases it was arranged that they should be re-examined in the light of the discussion.

Removal of Wrecks Outside the Limit of a Port

The Executive Committee has decided to take steps to bring to the notice of the Government the problem of the removal of wrecks which are lying in or near the approaches to the harbours of the United Kingdom.

Members are aware of the Arrangement which the Association and the Railway Companies owing Docks entered into with the Admiralty and the Ministry of War Transport in September, 1941, under which a Port Authority in exercising its statutory powers of raising, removing, dispersing or destroying any wreck, would, if necessary, employ the Admiralty as contractors.

This Arrangement is to continue until the end of the present hostilities with Germany, and thereafter unless determined by three months' notice given by any of the parties.

When this Arrangement has been determined two problems will arise, namely, the question of the cost of the removal of wrecks, and, secondly, that of liability to third parties for failure to light and mark such wrecks.

The lighting and marking of wrecks lying in or near the approaches, and the removal or dispersal of such wrecks in the interests of navigation will impose such a burden upon Harbour Authorities that it is likely to be excessive, and beyond their resources, and the Association consider that the obligation should be undertaken by His Majesty's Government as a national charge.

The Association have not any staistics as to wreck and obstructions lying in or near the approaches to the various harbours, but the position of Harbour Authorities is now probably more serious than it was after the termination of the last war, and it will be remembered that after or during the 1914-18 war the Admiralty and Trinity House between them undertook the responsibility of removing war-time wrecks as a national charge, and the Harbour Authorities concerned were relieved of all expense and responsibility in respect of these wrecks.

Post-War Organisation: Docks and Harbours

This subject has, as Members know, been under close consideration by a Special Committee, consisting of the General Managers of the Ports of London, Liverpool, Bristol, Manchester, the Tyne, Belfast, Glasgow and Leith, with the General Managers of the four amalgamated Railway Companies, presided over by the Chairman of the Executive Committee.

The reason which moved the Executive Committee to set up the Special Committee was mainly that representations had been made by the Minister of War Transport that he would be glad to consider any proposals which had been formulated.

The Report presented by the Special Committee to the Executive Committee in November was unanimously accepted.

On being circulated to the Members for their approval a number considered that the matter was of such importance that it should be brought before a Special General Meeting of the Association before any further action should be taken with regard to it.

This course is being adopted, and the Report is to be considered on the morning of the 14th February, immediately prior to the Annual Meeting.

In the meantime it is not proposed to refer to the suggestions made in the Report in detail.

Catering Wages Board: Canteens

The Ministry of Labour and National Service asked the Association and the National Association of Port Labour Employers to nominate jointly a representative on the above Board, and Mr. A. K. Graham, Chairman, Staff Committee, Port of London Authority, whose name was put forward by both bodies, was duly appointed.

Institute of Transport: Dock and Harbour Awards

The Association (*vide* Cir. No. 589, dated 14th July) since the year 1927 has donated annually through the Institute of Transport gold and silver medals for the best paper presented on Dock, Harbour or Conservancy subjects, although there have been years when the medals have not been awarded.

A change in the conditions and form of prizes has been approved by the Executive Committee, and the following arrangement now governs the awards, namely:—

To promote the study by younger men engaged in Dock and Harbour undertakings of Dock, Harbour and Conservancy subjects, and of transport generally, and to encourage the writing of original papers on Dock, Harbour and Conservancy subjects.

Dock and Harbour Authorities' Association—continued

The Association offers two awards annually through the Institute of Transport:—

(i) £15 available for award annually for a meritorious paper on a Dock, Harbour or Conservancy subject.
(ii) £5 available annually for a paper of merit on a Dock, Harbour or Conservancy subject by a graduate or student, or for a specially praiseworthy performance at the Graduateship or Associate Membership examination by a student or graduate engaged in Dock, Harbour or Conservancy work (as the Council of the Institute may decide on reviewing papers submitted and performances at the examinations).

The Executive Committee hope that Members will bring the matter to the notice of their staffs.

Miscellaneous Matters.

Arrangement with the Government, 1920, for payment of dues on ships and goods.
Application of Arrangement to:—

(a) Port Rates on Meat for Service Departments.
(b) Shipments on account of N.A.A.F.I. Stores and United Kingdom Corporation.
(c) Small Parcels of Commercial Goods—War Office. (Cir. No. 590).
(d) Canadian Military Traffic.
(e) Railway Materials—Dues on (Cir. No. 591).
(f) Neutral Governments—War Department Traffic.
(g) Salvage Vessels—Form of Certificate (Cir. No. 590).
(h) Landborne Coal—Dues on.
(i) Ships of War, Hospital Ships, etc.—Query by Australian Harbour Association.
(j) Compounding of Harbour Rates on Vessels, etc.
(k) Ballast—Dues on.
(l) Ships carrying Mixed Cargoes—Dues on.
(m) " Goods for Sale or Re-sale or for any Trading Purpose "—Cases arising under.

A.R.P. Uniforms.
Assessment of Value of Goods and Services under Clause 4 of the 1920 Arrangement.
British Employers Confederation—General Correspondence.
British Standards Institution—Specifications.
Buoyage and Lighting of Coasts.
Canteen Mugs—Request for Marking to Prevent Pilferage.
Cargo Containers—Dues on.
Chartered and other Bodies (Temporary Provisions) Act, 1939—Query as to Revocation.
Civil Defence Rest and Convalescence—Red Cross and St. John Organisations.
Coal for use in Dredgers—Price.
Damage to Dock Road by War Department Vehicles.
Handling of Explosives.
Income Tax—

(a) Finance Act, 1937—Allowance for Depreciation for Mills, Factories, etc.
(b) Budget Proposals—Industrial Re-equipment of Plant and Machinery—Post-War Period.

Local Authorities—Alterations in Borrowing.
New Vessels completing in Docks—Dock Rent on.
Personal Injuries (Emergency Provisions) Act, 1937.
Pilotage Matters.
Police Forces of Dock and Harbour Undertakings—Civilian Injuries Scheme—Post-War Credits
Rates and Charges—

(a) Increase in Statutory Maxima.
(b) Procedure for obtaining Increase.

Requisitioning of Harbour Authorities' Property.
Special Rebates at Grant-aided Works and Appliances—Extension to U.S.A. and other Allied Governments.
Sports Requisites—Allocation by Board of Trade.
Stealing of Goods at Ports.
Thomas Gray Memorial Trust—Awards (Cir. No. 587).
Tonnage Measurement—Proposals for Revision of Rules.
Troop Comforts—Dues on—Order of St. John and Red Cross Organisations.
Vessels awaiting Orders but not using Dock Facilities—Dues on.
Vessels carrying out Engine Trials—Precautions in force.
War Damage Claims—Engineers' and Accountants' Committees.
War Risks Danger Money—Crews of Harbour Authorities' Vessels.

Accounts

The expenditure charged to the year's Accounts amounts to £3,751 13s. 8d. and £3,745 1s. 6d. was subscribed by Members.

The surplus for the year amounted to £235 12s. 4d., but de-deducting the deficiency brought forward on the 1943 Accounts, namely, £230 1s. 7d., the surplus at the 31st December, 1944, amounted to £5 10s. 9d.

The Report is signed by the Chairman and the Secretary.

APPENDIX.

Reconstruction Areas and Planning.

1. The Dock and Harbour Authorities' Association (referred to in this memorandum as " the Association ") consists of 71 members, representing undertakings providing accommodation for most of the shipping of the United Kingdom dealing with the vast majority of the general cargo trade and the docks owned by the four amalgamated Railway Companies.

2. The Association understand that a Committee under the Chairmanship of the Solicitor-General has been set up with the following terms of reference:—

(1) To consider and report upon the relations between statutory undertakers and planning authorities, and to make recommendations; and in particular to consider:—

(a) on what conditions in regard to the provision of alternative accommodation or otherwise should planning authorities be authorised to acquire land held by statutory undertakers for the purposes of their undertaking:—
(i) in reconstruction areas,
(ii) elsewhere for the purposes of planning;
(b) to what extent and in what manner should statutory undertakers be relieved of any obligations resting on them under statute which by reason of planning restrictions imposed on them or the acquisition of land held for the purposes of their undertaking they may be unable to discharge;
(c) on what basis should statutory undertakers be entitled to compensation in respect of loss occasioned by reason of a planning restriction prohibiting—
(i) the carrying out of works or the erection of buildings authorised by any Act of Parliament or Order approved by Parliament on land designated in the Act order.
(ii) the replacement of works or buildings already carried out or erected under an Act or Order as in (i);
(d) to what extent, by what means and on what terms should statutory undertakers be required to execute works and/or provide services essential for reconstruction.

3. The Association wish to make it clear that the observations contained in this memorandum can only deal with general principles, as no specific details of the proposed legislation have yet been made, and may accordingly be reviewed when the Government's Bill is produced. The Association would also like to supplement this memorandum by verbal statements to be given by two representatives of the Association, one of whom should appear on behalf of the non-railway owned ports and the other the railway-owned ports.

4. The general functions of the undertakings represented by the Association are those of Conservancy Authorities and Dock Authorities owing and controlling enclosed docks, and providing accommodation and facilities for the loading and discharging of both passengers and goods from vessels at wharves and quays on the banks of navigable rivers. Some of the undertakings provide

Dock and Harbour Authorities' Association—continued

ancillary services to shipping, such as pilotage and the provision of lights and buoys.

5. The undertakings represented by the Association exercise their functions under private Acts of Parliament or Orders having the effects of Acts, most of which contain general powers to acquire land, which have been exercised with a view to the future development of the undertaking.

6. Apart from general powers to construct works on land acquired by them, many undertakings have obtained specific powers to erect particular works on specified pieces of land.

7. The fact that the undertakings have not yet exercised their powers, whether general or specific, relating to the development or construction of new works on land acquired by them, whether by virtue of their statutory powers or by agreement, is no criterion that land at present undeveloped will not at some future date be required for the purpose of the undertaking.

8. As the law stands at present under the existing Town and Country Planning Acts protection has been given to statutory undertakings as land belonging to statutory undertakers cannot be taken unless the land is required for the widening of an existing highway, and even in that event the undertakers' consent is required, such consent not to be unreasonably withheld. The question whether it has been so withheld is decided by the Minister of Health, who, before giving his decision, must consult the Minister concerned with the function of the statutory undertakers, who must be afforded an opportunity of being heard by one or more persons appointed jointly by the two Ministers.

9. A Dock or Harbour Authority can only provide the accommodation necessary for the improvement and development of its undertaking on lands within a defined area in the vicinity of a port, which must be in the estuary of a river.

Development may take several forms:—

1 An entirely new system or group of docks could be constructed;

2 An existing system may be extended;

3 Further accommodation may be provided on the banks of an estuary.

10. Not all land in the vicinity of the estuary is suitable for the purpose of the undertaking because conditions such as rise and fall of the tide, the depth of water available, and the strength of currents must be taken into consideration. Channels may adapt themselves to the ordinary use of traffic to the docks, and the closing or abandonment of a group of docks may have far-reaching effects upon those channels. Putting the only land which is suitable for one specific purpose to another purpose is contrary to good planning.

11. The Association submit that a Planning Authority should not be invested with powers of compulsory acquisition of land belong to a Dock and Harbour Authority unless those powers receive the sanction of Parliament.

12. If land be so acquired from the undertaker:—

(1) the undertaker should be relieved from any obligations, either statutory, contractual or otherwise, which cannot reasonably be carried out without using the land so acquired;

(2) the undertaker should be compensated for additional expense to which he may be put in discharging those obligations.

13. The Association submit that there can be no means of determining the fair compensation for land taken from a Dock or Harbour Authority without their consent, as the loss of such land may fundamentally affect the whole trade of the undertaking.

14.—I. In the event of a portion of a dock being taken the compensation should at least be on the basis of:—

(1) Loss;

(2) Severance;

(3) Injurious affection.

II. In the event of a whole dock being so taken the compensation should at least be on the basis of the value of the undertaking so acquired.

15. The Association maintain that the design and siting of works required for the undertaking of a dock or harbour is fundamental to its efficiency, and they could not agree to designing and siting being subject to control by the planning authority.

16. The Association assume that Dock and Harbour Undertakings will be afforded protection against prohibition of development at least to the extent contemplated by the draft Interim Development Order, and are reserving their consideration of the whole question pending the new legislation.

17. No Dock or Harbour Undertaking should be required to provide services which are outside its present powers.

18. The Association further submit that every Dock and Harbour Undertaking should have an opportunity of being heard in connection with the planning of land situated on the banks of any river estuary within the jurisdiction of that undertaking.

LIST OF MEMBERS FOR 1945.

District (Rule 6) shewn thus:—(i).

1. Aberdeen Harbour Commission (ix).
2. Aire and Calder Navigation (ii).
3. Ardrossan Harbour Company (viii).
4. Bangor (Co. Down) Authority (x).
5. Belfast Harbour Commission (x).
6. Berwick Harbour Commission (i).
7. Bideford Corporation (iv.).
8. Blyth Harbour Commission (i).
9. Boston Corporation (ii).
10. Bristol Authority, Port of (v).
11. Caernarvon Harbour Trust (v).
12. Cattewater Commission (iv).
13. Clyde Navigation Trust (viii).
14. Clyde Pilotage Authority (viii).
15. Cowes Harbour Commission (iv).
16. Dartmouth Harbour Commission (iv).
17. Dover Harbour Board (iv).
18. Dublin Port and Docks Board (xi).
19. Dundee Harbour Trust (ix).
20. Exmouth Dock Company (iv).
21. Forth Conservancy Board (ix).
22. Forth (Trinity House of Leith) Pilotage Authority (ix).
23. Fraserburgh Harbour Commission (ix).
24. Gloucester Authority, Port of (v).
25. Gloucester Harbour Trust (v).
26. Grand Union Canal Company (iii).
27. Granton Harbour Limited (ix).
28. Great Yarmouth Port and Haven Commission (ii).
29. Greenock Harbour Trust (viii).
30. Hartlepool Port and Harbour Commission (ii).
31. Harwich Harbour Conservancy Board (ii).
32. Humber Conservancy Board (ii).
33. Inverness Harbour Trust (ix).
34. Ipswich Authority, Port of (ii).
35. King's Lynn Conservancy Board (ii).
36. King's Lynn Docks and Railway Company (ii).
37. Lancaster Port Commission (vi).
38. Larne Harbour Limited (x).
39. Leith Dock Commission (ix).
40. Limerick Harbour Commission (xi).
41. Littlehampton Harbour Board (iv).
42. Llanelly Harbour Trust (v).
43. London Authority, Port of (iii).
44. Londonderry Port and Harbour Commission (x).
45. Manchester Ship Canal Company (vii).
46. Medway Conservancy Board (iii).
47. Mersey Docks and Harbour Board (vi)
48. Milford Docks Company (v).
49. Newlyn Pier and Harbour Commission (iv).
50. Newport Harbour Commission (v).
51. Par, Port of, Limited (iv).
52. Penzance Corporation (iv).
53. Poole Harbour Commission (iv).
54. Portsmouth, City of (iv).

Dock and Harbour Authorities' Association
(continued)

55. Preston Authority, Port of (vi).
56. Ramsgate, Port of (iv).
57. Sandwich Port and Haven Commission (iv).
58. Scarborough Harbour Commission (ii).
59. Seaham Harbour Dock Company (ii).
60. Shoreham Harbour Trust (iv).
61. Southampton Harbour Board (iv).
62. Tees Conservancy Commission (ii).
63. Truro, City of (iv).
64. Tyne Improvement Commission (i).
65. Warkworth Harbour Commission (i).
66. Wear Commission, River (ii).
67. Whitehaven Harbour Commission (vi).
68. Workington Harbour and Dock Board (vi).
69. Yarmouth (Isle of Wight) Pier and Harbour Commissions (iv).

70. Great Western Railway
71. London Midland & Scottish Railway
72. London & North Eastern Railway
73. Southern Railway.

In respect of their Docks and Harbours.

Honorary Members.

Harbours Association of New Zealand.
Bombay Port Trust.
Interstate Conference of Australian Harbour Authorities.

The Port of London as Base for the Invasion of Europe

Interesting Revelations

The following statement has been released for publication:—

London played a big part in launching the D-Day Armada of invasion ships and the subsequent build-up at the beachheads and at the prefabricated Port of Arromanches.

From the commencement of the operation to the 31st August, 1944, there were loaded and despatched from the Port of London: Personnel of the B.L.A., over 311,000; vehicles, over 123,000; General Stores, including ammunition, over 666,000 tons.

Only a short period was allowed to the Port for the preparation of this great task, but a slight idea of which can be assessed from the foregoing figures. The accomplishment is all the more remarkable when it is realised that the working of commercial ships in the Port, vital to London's daily food and supplies, was proceeding simultaneously. The operational task involved the loading of approximately 2,000 ships—coasters, ocean-going ships, L.S.T.'s (Landing Ship Tanks) and other types. Practically the whole of the operation was carried out at the docks of the Port of London Authority, a few of the "invasion ships" being dealt with at riverside wharves. The tidal conditions on the Thames rendered necessary extremely fine calculation and organisation for docking and undocking of the fleet of vessels in order to avoid delay and confusion. Special "hards" for the L.S.T.'s had to be constructed and marshalling areas for vehicles prepared in the docks, as well as special access to some of the docks.

Preliminary organisation required the closest collaboration by the Army, Navy and Air Force with the Port of London Authority and the successful execution is itself a tribute to the Trade Unions and London Dockers who, during the worst period of the day and night Flying Bomb assault worked enthusiastically handling astonishing tonnages daily to keep pace with the finely-cut time table. This was essential, apart from other considerations, to avoid congestion on the railways and at the Exchange Sidings as the bulk of the war supplies and materials poured into the docks on the railways from all over the country. During the period to 31st August, 1944, 62,000 wagons were dealt with. Normally barge and road transport are primarily concerned with the movement of traffic to and from the Port of London so that although craft were extensively employed, the big switch to movement in by rail presented special problems which were successfully met by the Port Authority's railway department.

To carry out the operation special arrangements had to be made to organise the Dock Pilots in the Port and also River and Sea Pilots. Other factors rendered the launching of the invasion armada from the Port of London noteworthy under difficult conditions.

During the National emergency period of 1940 and 1941, a large amount of equipment, including many cranes, railway equipment, craft, tugs, etc., were acquired to the Military Authorities or loaned to other ports, inadequately equipped for the abnormal traffic they were suddenly called upon to handle, and which could not be returned or replaced. Many skilled dockers, including nearly 1,200 members of the Port Authority's supervisory and permanent staff, are serving with the Forces.

There was also the necessity for arrangements to be made in the extreme secrecy and for the operation of a special Security Organisation.

Simultaneously the Port was completing the construction and despatch of many of the units destined to form the prefabricated Port of Arromanches, of which London was responsible for 75% of the concrete construction work.

American Army Operation of European Ports

The following statement has been received from the Headquarters of the United States Army:—

The 6th U.S. Army Port, which recently received the Meritorious Service Unit Plaque for its exceptional work at the Port of Naples, is now located at Marseilles in Southern France, and is discharging cargo in amounts exceeding its targets.

The port opened with one reconditioned berth after its liberation on August 28th. Scheduled to supply the 7th United States Army and most of the 6th Army Group, the number of berths for incoming ships has since been increased. A shortening of the time required for unloading ships has permitted a rapid turnover of convoys.

When this badly-damaged port was taken over by the Transportation Corps, not even one berth was open. The northern and southern entrances were blocked by scuttled ships. Within the harbour vessels were scuttled, and the total damage was worse than had been found at Naples. Tangled wreckage of large cranes, blasted warehouses, small craft and rubble were strewn around the bombed quaysides. Sea mines had been planted in the channel entrance of the harbour, and it took several days to remove the obstacles before repair operations could start.

This, however, did not present so bad a picture to the members of the port as did the scene at Naples in October, 1943. The Germans had boasted of their demolition work at Naples, saying the Allies would never use the port. Yet in six months after their arrival the 6th Port had rehabilitated it and was discharging tonnage in amount that made it then the leading Allied military port in the world.

By January 1st, 1944, the port at Naples daily discharged thousands of tons of vital supplies for the 5th and 8th Armies. Two world records for discharges of tonnage were made, and they have never been bettered.

With such work as they performed in back of them, the port headquarters is now aiming to make the Port of Marseilles the most vital and largest supply port in France.

Irish Harbour Finances.

An Order has been issued by the Eire Government under which the local authorities are empowered to assist harbour authorities in Southern Ireland who, owing to conditions arising out of the present emergency, are unable to obtain the necessary funds for the essential maintainance and repair of their harbours. Under this Order the local rating authorities may advance funds to the harbour authorities either by grant or loan guarantee. The borrowing powers of the harbour authorities have also been extended.

Southampton Harbour Board

Association with Southampton Borough Council

Interesting addresses were given on February 7th at a meeting of the Southampton Round Table by Mr. H. A. Short, M.C., Docks and Marine Manager of the Southern Railway Company, and Alderman T. Lewis, J.P., on the relationship between the Southampton Harbour Board and the Southampton Borough Council. Mr. Short is the present chairman of the Board and Alderman Lewis, deputy chairman and senior member.

The following report of the addresses is extracted from the *Southern Daily Echo*:

Mr. Short, who spoke first, said the relationship between the Board and the Corporation had always been a very close one as might be assumed in the cases of two bodies having interests in common. Both bodies had the welfare and advancement of Southampton at heart, and, until the last three decades, the relationship might be said to have been almost a family one, with the Corporation, as the parent body, controlling the development of the Harbour Board.

Mr. Short went on to give an interesting survey of the formation and development of the harbour authority since the early days of the nineteenth century.

" Petty Customs "

He explained that before 1803 Southampton Corporation owned and controlled the facilities which existed at the time for the accommodation of shipping and cargoes, and that they were entitled, by virtue of charters granted to them by the Kings and Queens of England, to receive certain dues known as " petty customs," payable on ships and goods at the port.

As a result of an agitation by the burgesses for improved accommodation for ships and for the abolition of these petty customs, the Corporation agreed to forfeit their rights to such charges upon compensation being given and improved accommodation, in the matter of docks, being provided.

In the year 1803 an Act of Parliament created a new authority to take over the port with power to make docks, wharves, piers, warehouses, etc. This new authority, known as the " Port Commissioners," consisted of the Mayor, the Recorder, all the members of the Town Council and ten " Specific Commissioners."

Compensation for the loss of petty customs was provided for in the Act in the form of an annual payment to the Corporation of one-fifth of the income derived by the Harbour Authority from dues on vessels entering the port, and wharfage and storage of goods handled at the Town Quay. This arrangement was still in operation to-day.

As an indication of the development of the port since that time, Mr. Short mentioned that up to 1803 the income received by the Corporation from shipping and goods did not exceed £200 per annum, whereas the annual one-fifth dues payment made by the Harbour Board to the Corporation at the time of the outbreak of the present war exceeded £15,000.

Administrative Changes

Mr. Short went on to refer to the incorporation, by Act of Parliament in 1836, of the Southampton Dock Company, the building of the docks, the purchase, in 1892, of the whole of the Dock Company's estate by the London and South-Western Railway Company (now a component of the Southern Railway Company), and the subsequent enlargement and development of the docks.

The powers of the Port Commissioners were extended by Acts of Parliament, and the title of the Authority was altered to its present-day one of the Southampton Harbour Board, but the composition of the Board was not disturbed until 1913.

So, from 1803 until 1913, Southampton Corporation, by virtue of its preponderance of voting power on the Harbour Board, had exercised almost complete control of that authority. Any measure affecting the interests of the Borough Council was voted for or against " en bloc " by the Council members of the Board, while, generally speaking, routine matters were left to the deliberations of Specific Commissioners.

The Board was reconstituted by Act of Parliament in 1913 as a result of recommendations by a Commission, and the membership was limited to 26, on which the Corporation's representation was fixed at seven (since increased to eight with the inclusion of the Itchen Urban District Council representative).

The 26 members to-day comprised, in addition to eight members of the Council, three members from the Southern Railway Company, four members representing the interests of foreign-going vessels, two members representing the interests of coasting vessels, two from the Southampton Chamber of Commerce, and one each representing waterside frontagers, traders, Trinity House, the War Office, the Admiralty, labour interests, and the Hampshire County Council.

Mr. Short mentioned that Alderman Lewis, the present deputy-chairman of the Board, was the only Corporation member who also served on the Board before its re-constitution.

Past records showed, he said, that the relationship between the Corporation and the Board had been a very business-like one, while a co-operative spirit had been evident in all matters affecting the welfare of the town and port. There had been, at times, criticism of the allocation of part of the Harbour Board's income to the Corporation.

Necessity for Co-operation

Alderman Lewis's remarks were illuminated with amusing " asides " and lively reminiscences of the days when the relations between the Borough Council and the Harbour Board were not so happy as they are to-day.

He expressed the view that the two bodies ought to work together amicably because their interests were in many ways the same. The progress of the town must depend to a very large extent on the progress of the port.

Docks and shipping did not represent to-day so great a proportion of the industries of Southampton as they did 40 years ago, but they were still very important and considerable.

Having regard to the superb facilities of the port, every attention must be paid to its development, and in that respect he thought it could be said that the Borough Council desired to work in perfect harmony with the Harbour Board.

Recalling " the bad old days " when the relations between the two bodies were not so friendly, the alderman said a very watchful eye had to be kept not only on the Harbour Board, but on the London and South-Western Railway Company also.

After the acquisition of the " old sluggish " Dock Company by the railway company in 1892, it was thought by many that the railway company would get too big a hold on the town. The speaker commented that it was certainly to the advantage of the town that a wideawake company like the L and S.W.R. should take over the docks, failing—what some people thought should have happened—the Council themselves taking them over.

Alderman Lewis declared that the composition of the Harbour Board in those days was not very satisfactory. Although every member of the Council was a member of the Board, it was the 10 Specific Commissioners who really " ran the show." As these commissioners had very close associations with the railway and shipping companies he suggested that they were more alive to the interests they represented than to the interests of the town as a whole.

He expressed the opinion that the change in the constitution of the Board was made because the Borough Council members were taking a more active interest in the work of the Board and it was felt that the Council had too much power on the Board.

Struggle for Dues

Alderman Lewis went on to describe the struggle which resulted in the Council receiving an annual payment of one-fifth of the Board's income from dues, and the unsuccessful attempts that had since been made to upset the arrangement.

" There will be a big struggle if another attempt is made to try to filch from the Borough Council their share of these dues," he asserted.

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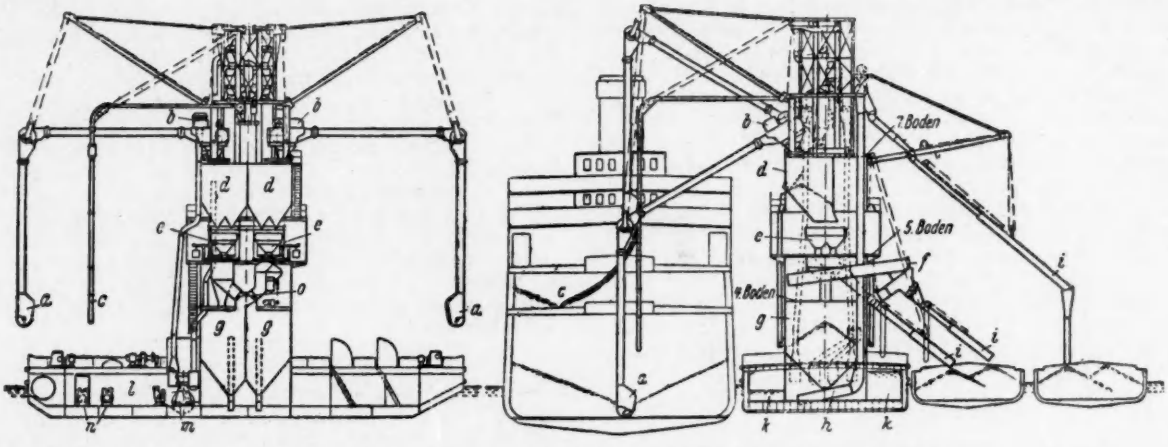
Notable Double-Action Grain Elevator-Conveyor

The Transactions of the Institute of Marine Engineers for December, 1944, include among the technical press abstracts, the following description of a Diesel-equipped Floating Grain Elevator, extracted from *Gas and Oil Power*, October, 1944:



Longitudinal and transverse sections of floating grain elevator with both chain conveyor and suction plants.

(a) Chain conveyor head. (b) Chain conveyor drive. (c) Suction plant head. (d) First bunker. (e) Weighing machines. (f) Horizontal chain conveyor. (g) Main bunker. (h) Chain conveyor to lift grain to lighter. (i) Discharge pipes. (k) Water ballast trimming tank. (l) Engine Room. (m) Diesel-driven air pump. (n) Diesel-generator sets. (o) Flap valves for simultaneous discharging of two types of grain.

An article by Dr. Ing. H. R. Müller in a recent issue of Z.V.D.I. describes two Diesel-engined floating grain elevators which have been put in service on the Continent. Each elevator is equipped with two chain conveyors of 200 tons per hour capacity and with two suction heads each of 50-60 tons per hour capacity. The total capacity of each elevator is therefore about 500 tons per hour, and as the two elevators are usually operated together, one discharging cargo from two forward holds of a ship whilst the other works on the after holds, this new cargo-handling equipment is capable of handling a grain cargo at the exceptional rate of 1,000 tons per hour. The general arrangement of these elevators is shown in the accompanying sectional diagrams. The two conveyors are quite separate and able to work independently of one another, so that they can be used simultaneously for handling two different types of grain, if required. The conveyor chains have a speed of about 200-ft. per min. and are driven by electric motors, a 65 h.p. motor being fitted for each conveyor. In addition to these motors, 32 others are installed for various duties. They are supplied with three-phase current at 400 volts from two alternators each driven by a 90 h.p. Diesel engine. Two further Diesel engines of similar power are used to drive the air pumps of the two suction plants. These air pumps are double-acting reciprocating machines, each of 2,800 cu. ft. per min capacity when running at 210 r.p.m., the delivery pressure of the air being 6 lbs. per sq. in. Engine starting air is supplied by three of the main Diesel engines. The power consumption per ton of cargo handled by the chain conveyors is stated to be only about 20 per cent. of that taken by suction elevators of the same capacity, and it is claimed that the adoption of Diesel drive has proved both economical and convenient.

Southampton Harbour Board

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The amount received from this source had been most useful to the town and would be more so in the immediate future, with so many important projects to be carried out.

Some people argued that instead of one-fifth of the dues being paid to the Corporation the money should be used to improve the harbour. His answer to that was that the town, by virtue of the fact that it possessed the harbour and its natural amenities, was entitled, for all time, to have a measure of benefit from the shipping using the harbour.

"If we should come to the position when the money is absolutely needed by the Harbour Board," he said, "I do not think the town would hesitate to come to the support of the Board."

Thanks were accorded to Mr. Short and Alderman Lewis, on the proposition of Tabler R. R. Newitt, seconded by Tabler W. E. Tickle, chairman of the Table.

Restoration of Sea of Azov Ports.

The Russian ports of Rostov, Mariupol and Taganrog on the Sea of Azov are reported to be once more in full commission after three years abandonment to enemy forces.

The Singapore Floating Dock

Reported Second Sinking

Early in February it was announced that, in an air-raid by Super-Fortresses, the large floating dock at Singapore was sunk for the second time. The first sinking occurred when Singapore fell into Japanese hands in February, 1942. It was subsequently announced that the dock had been refloated and repaired by Japanese engineers.

The dock with its lifting capacity of 50,000 tons, involving the use of over 20,000 tons of steel and 3½ million rivets, was built in 1927-8 at the Wallsend shipyard of Messrs. Swan, Hunter and Wigham Richardson, Ltd. It was constructed in seven sections and was conveyed to the East in two tows by Messrs. L Smit and Co., of Rotterdam. Both tows arrived safely at Singapore in October, 1928. At the time, the dock was the largest structure which had passed through the Suez Canal or crossed the Indian Ocean.

The dock is 855-ft. long and 172-ft. wide externally (the clear internal width between fenders being 126-ft. 6-in.), with an overall depth of 75-ft. For operating purposes, a depth of 72-ft. is required. The pumping plant is capable of dealing with 30,000 tons of water per hour. It was in frequent use before the war for the overhaul of naval vessels.

The dock was officially opened on August 14th, 1929.